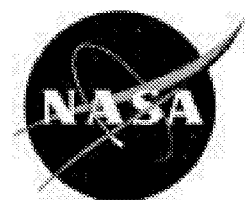


NASA/SP—2000-7011/SUPPL502  
July 2000

# **AEROSPACE MEDICINE AND BIOLOGY**

A CONTINUING BIBLIOGRAPHY WITH INDEXES



National Aeronautics and  
Space Administration  
**Langley Research Center**  
**Scientific and Technical  
Information Program Office**

## The NASA STI Program Office . . . in Profile

Since its founding, NASA has been dedicated to the advancement of aeronautics and space science. The NASA Scientific and Technical Information (STI) Program Office plays a key part in helping NASA maintain this important role.

The NASA STI Program Office is operated by Langley Research Center, the lead center for NASA's scientific and technical information. The NASA STI Program Office provides access to the NASA STI Database, the largest collection of aeronautical and space science STI in the world. The Program Office is also NASA's institutional mechanism for disseminating the results of its research and development activities. These results are published by NASA in the NASA STI Report Series, which includes the following report types:

- **TECHNICAL PUBLICATION.** Reports of completed research or a major significant phase of research that present the results of NASA programs and include extensive data or theoretical analysis. Includes compilations of significant scientific and technical data and information deemed to be of continuing reference value. NASA's counterpart of peer-reviewed formal professional papers but has less stringent limitations on manuscript length and extent of graphic presentations.
- **TECHNICAL MEMORANDUM.** Scientific and technical findings that are preliminary or of specialized interest, e.g., quick release reports, working papers, and bibliographies that contain minimal annotation. Does not contain extensive analysis.
- **CONTRACTOR REPORT.** Scientific and technical findings by NASA-sponsored contractors and grantees.

- **CONFERENCE PUBLICATION.** Collected papers from scientific and technical conferences, symposia, seminars, or other meetings sponsored or cosponsored by NASA.
- **SPECIAL PUBLICATION.** Scientific, technical, or historical information from NASA programs, projects, and missions, often concerned with subjects having substantial public interest.
- **TECHNICAL TRANSLATION.** English-language translations of foreign scientific and technical material pertinent to NASA's mission.

Specialized services that complement the STI Program Office's diverse offerings include creating custom thesauri, building customized databases, organizing and publishing research results . . . even providing videos.

For more information about the NASA STI Program Office, see the following:

- Access the NASA STI Program Home Page at [\*http://www.sti.nasa.gov\*](http://www.sti.nasa.gov)
- E-mail your question via the Internet to [\*help@sti.nasa.gov\*](mailto:help@sti.nasa.gov)
- Fax your question to the NASA STI Help Desk at (301) 621-0134
- Telephone the NASA STI Help Desk at (301) 621-0390
- Write to:  
NASA STI Help Desk  
NASA Center for AeroSpace Information  
7121 Standard Drive  
Hanover, MD 21076-1320

# Introduction

This supplemental issue of *Aerospace Medicine and Biology, A Continuing Bibliography with Indexes* (NASA/SP—2000-7011) lists reports, articles, and other documents recently announced in the NASA STI Database.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which humans are subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Applied research receives the most emphasis, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the publication consists of a standard bibliographic citation accompanied, in most cases, by an abstract.

The NASA CASI price code table, addresses of organizations, and document availability information are included before the abstract section.

Two indexes—subject and author are included after the abstract section.

# ***SCAN Goes Electronic!***

If you have electronic mail or if you can access the Internet, you can view biweekly issues of *SCAN* from your desktop absolutely free!

*Electronic SCAN* takes advantage of computer technology to inform you of the latest worldwide, aerospace-related, scientific and technical information that has been published.

No more waiting while the paper copy is printed and mailed to you. You can view *Electronic SCAN* the same day it is released—up to 191 topics to browse at your leisure. When you locate a publication of interest, you can print the announcement. You can also go back to the *Electronic SCAN* home page and follow the ordering instructions to quickly receive the full document.

Start your access to *Electronic SCAN* today. Over 1,000 announcements of new reports, books, conference proceedings, journal articles...and more—available to your computer every two weeks.

**Timely  
Flexible  
Complete  
FREE!**

For Internet access to *E-SCAN*, use any of the following addresses:

<http://www.sti.nasa.gov>

[ftp.sti.nasa.gov](ftp://sti.nasa.gov)

[gopher.sti.nasa.gov](gopher://sti.nasa.gov)

To receive a free subscription, send e-mail for complete information about the service first. Enter **scan@sti.nasa.gov** on the address line. Leave the subject and message areas blank and send. You will receive a reply in minutes.

Then simply determine the *SCAN* topics you wish to receive and send a second e-mail to **listserv@sti.nasa.gov**. Leave the subject line blank and enter a subscribe command, denoting which topic you want and your name in the message area, formatted as follows:

**Subscribe SCAN-02-01 Jane Doe**

For additional information, e-mail a message to **help@sti.nasa.gov**.

Phone: (301) 621-0390

Fax: (301) 621-0134

Write: NASA STI Help Desk  
NASA Center for AeroSpace Information  
7121 Standard Drive  
Hanover, MD 21076-1320

**Looking just for *Aerospace Medicine and Biology* reports?**

Although hard copy distribution has been discontinued, you can still receive these vital announcements through your *E-SCAN* subscription. Just **Subscribe SCAN-AEROMED Jane Doe** in the message area of your e-mail to **listserv@sti.nasa.gov**.



# Table of Contents

Records are arranged in categories 51 through 55, the Life Sciences division of *STAR*. Selecting a category will link you to the collection of records cited in this issue pertaining to that category.

<b>51</b>	<b>Life Sciences (General)</b>	<b>1</b>
	Includes general research topics related to plant and animal biology (non-human); ecology; microbiology; and also the origin, development, structure, and maintenance, of animals and plants in space and related environmental conditions. For specific topics in life sciences see <i>categories 52 through 55</i> .	
<b>52</b>	<b>Aerospace Medicine</b>	<b>5</b>
	Includes the biological and physiological effects of atmospheric and space flight (weightlessness, space radiation, acceleration, and altitude stress) on the human being; and the prevention of adverse effects on those environments. For psychological and behavioral effects of aerospace environments see <i>53 Behavioral Sciences</i> . For the effects of space on animals and plants see <i>51 Life Sciences</i> .	
<b>53</b>	<b>Behavioral Sciences</b>	<b>15</b>
	Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.	
<b>54</b>	<b>Man/System Technology and Life Support</b>	<b>18</b>
	Includes human factors engineering; bionics, man-machine, life support, space suits and protective clothing. For related information <i>52 Aerospace Medicine</i> .	
<b>55</b>	<b>Exobiology</b>	<b>23</b>
	Includes astrobiology; planetary biology; and extraterrestrial life. For the biological effects of aerospace environments on humans see <i>52 Aerospace Medicine</i> ; on animals and plants see <i>51 Life Sciences</i> . For psychological and behavioral effects of aerospace environments see <i>53 Behavioral Sciences</i> .	

## Indexes

Two indexes are available. You may use the find command under the tools menu while viewing the PDF file for direct match searching on any text string. You may also view the indexes provided, for searching on *NASA Thesaurus* subject terms and author names.

<b>Subject Term Index</b>	<b>ST-1</b>
<b>Author Index</b>	<b>PA-1</b>

Selecting an index above will link you to that comprehensive listing.

# Document Availability

Select **Availability Info** for important information about NASA Scientific and Technical Information (STI) Program Office products and services, including registration with the NASA Center for Aerospace Information (CASI) for access to the NASA CASI TRS (Technical Report Server), and availability and pricing information for cited documents.

# ***The New NASA Video Catalog is Here***

To order your **Free!** copy,  
call the NASA STI Help Desk at  
(301) 621-0390,  
fax to  
(301) 621-0134,  
e-mail to  
help@sti.nasa.gov,  
or visit the NASA STI Program  
homepage at  
<http://www.sti.nasa.gov>

## ***Explore the Universe!***

# Document Availability Information

The mission of the NASA Scientific and Technical (STI) Program Office is to quickly, efficiently, and cost-effectively provide the NASA community with desktop access to STI produced by NASA and the world's aerospace industry and academia. In addition, we will provide the aerospace industry, academia, and the taxpayer access to the intellectual scientific and technical output and achievements of NASA.

## Eligibility and Registration for NASA STI Products and Services

The NASA STI Program offers a wide variety of products and services to achieve its mission. Your affiliation with NASA determines the level and type of services provided by the NASA STI Program. To assure that appropriate level of services are provided, NASA STI users are requested to register at the NASA Center for AeroSpace Information (CASI). Please contact NASA CASI in one of the following ways:

E-mail: [help@sti.nasa.gov](mailto:help@sti.nasa.gov)  
Fax: 301-621-0134  
Phone: 301-621-0390  
Mail: ATTN: Registration Services  
NASA Center for AeroSpace Information  
7121 Standard Drive  
Hanover, MD 21076-1320

## Limited Reproducibility

In the database citations, a note of limited reproducibility appears if there are factors affecting the reproducibility of more than 20 percent of the document. These factors include faint or broken type, color photographs, black and white photographs, foldouts, dot matrix print, or some other factor that limits the reproducibility of the document. This notation also appears on the microfiche header.

## NASA Patents and Patent Applications

Patents owned by NASA are announced in the STI Database. Printed copies of patents (which are not microfiched) are available for purchase from the U.S. Patent and Trademark Office.

When ordering patents, the U.S. Patent Number should be used, and payment must be remitted in advance, by money order or check payable to the Commissioner of Patents and Trademarks. Prepaid purchase coupons for ordering are also available from the U.S. Patent and Trademark Office.

Patents and patent applications owned by NASA are available for licensing. Requests for licensing terms and further information should be addressed to:

National Aeronautics and Space Administration  
Associate General Counsel for Intellectual Property  
Code GP  
Washington, DC 20546-0001

## Sources for Documents

One or more sources from which a document announced in the STI Database is available to the public is ordinarily given on the last line of the citation. The most commonly indicated sources and their acronyms or abbreviations are listed below, with an Addresses of Organizations list near the back of this section. If the publication is available from a source other than those listed, the publisher and his address will be displayed on the availability line or in combination with the corporate source.

Avail: NASA CASI. Sold by the NASA Center for AeroSpace Information. Prices for hard copy (HC) and microfiche (MF) are indicated by a price code following the letters HC or MF in the citation. Current values are given in the NASA CASI Price Code Table near the end of this section.

*Note on Ordering Documents: When ordering publications from NASA CASI, use the document ID number or other report number. It is also advisable to cite the title and other bibliographic identification.*

Avail: SOD (or GPO). Sold by the Superintendent of Documents, U.S. Government Printing Office, in hard copy.

Avail: BLL (formerly NLL): British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England. Photocopies available from this organization at the price shown. (If none is given, inquiry should be addressed to the BLL.)

Avail: DOE Depository Libraries. Organizations in U.S. cities and abroad that maintain collections of Department of Energy reports, usually in microfiche form, are listed in Energy Research Abstracts. Services available from the DOE and its depositories are described in a booklet, *DOE Technical Information Center—Its Functions and Services* (TID-4660), which may be obtained without charge from the DOE Technical Information Center.

Avail: ESDU. Pricing information on specific data, computer programs, and details on ESDU International topic categories can be obtained from ESDU International.

Avail: Fachinformationszentrum Karlsruhe. Gesellschaft für wissenschaftlich-technische Information mbH 76344 Eggenstein-Leopoldshafen, Germany.

Avail: HMSO. Publications of Her Majesty's Stationery Office are sold in the U.S. by Pendragon House, Inc. (PHI), Redwood City, CA. The U.S. price (including a service and mailing charge) is given, or a conversion table may be obtained from PHI.

Avail: Issuing Activity, or Corporate Author, or no indication of availability. Inquiries as to the availability of these documents should be addressed to the organization shown in the citation as the corporate author of the document.

- Avail: NASA Public Document Rooms. Documents so indicated may be examined at or purchased from the National Aeronautics and Space Administration (JBD-4), Public Documents Room (Room 1H23), Washington, DC 20546-0001, or public document rooms located at NASA installations, and the NASA Pasadena Office at the Jet Propulsion Laboratory.
- Avail: NTIS. Sold by the National Technical Information Service. Initially distributed microfiche under the NTIS SRIM (Selected Research in Microfiche) are available. For information concerning this service, consult the NTIS Subscription Section, Springfield, VA 22161.
- Avail: Univ. Microfilms. Documents so indicated are dissertations selected from Dissertation Abstracts and are sold by University Microfilms as xerographic copy (HC) and microfilm. All requests should cite the author and the Order Number as they appear in the citation.
- Avail: US Patent and Trademark Office. Sold by Commissioner of Patents and Trademarks, U.S. Patent and Trademark Office, at the standard price of \$1.50 each, postage free.
- Avail: (US Sales Only). These foreign documents are available to users within the United States from the National Technical Information Service (NTIS). They are available to users outside the United States through the International Nuclear Information Service (INIS) representative in their country, or by applying directly to the issuing organization.
- Avail: USGS. Originals of many reports from the U.S. Geological Survey, which may contain color illustrations, or otherwise may not have the quality of illustrations preserved in the microfiche or facsimile reproduction, may be examined by the public at the libraries of the USGS field offices whose addresses are listed on the Addresses of Organizations page. The libraries may be queried concerning the availability of specific documents and the possible utilization of local copying services, such as color reproduction.

# Addresses of Organizations

British Library Lending Division  
Boston Spa, Wetherby, Yorkshire  
England

Commissioner of Patents and Trademarks  
U.S. Patent and Trademark Office  
Washington, DC 20231

Department of Energy  
Technical Information Center  
P.O. Box 62  
Oak Ridge, TN 37830

European Space Agency–  
Information Retrieval Service ESRIN  
Via Galileo Galilei  
00044 Frascati (Rome) Italy

ESDU International  
27 Corsham Street  
London  
N1 6UA  
England

Fachinformationszentrum Karlsruhe  
Gesellschaft für wissenschaftlich–technische  
Information mbH  
76344 Eggenstein–Leopoldshafen, Germany

Her Majesty's Stationery Office  
P.O. Box 569, S.E. 1  
London, England

NASA Center for AeroSpace Information  
7121 Standard Drive  
Hanover, MD 21076-1320

(NASA STI Lead Center)  
National Aeronautics and Space Administration  
Scientific and Technical Information Program Office  
Langley Research Center – MS157  
Hampton, VA 23681

National Technical Information Service  
5285 Port Royal Road  
Springfield, VA 22161

Pendragon House, Inc.  
899 Broadway Avenue  
Redwood City, CA 94063

Superintendent of Documents  
U.S. Government Printing Office  
Washington, DC 20402

University Microfilms  
A Xerox Company  
300 North Zeeb Road  
Ann Arbor, MI 48106

University Microfilms, Ltd.  
Tylers Green  
London, England

U.S. Geological Survey Library National Center  
MS 950  
12201 Sunrise Valley Drive  
Reston, VA 22092

U.S. Geological Survey Library  
2255 North Gemini Drive  
Flagstaff, AZ 86001

U.S. Geological Survey  
345 Middlefield Road  
Menlo Park, CA 94025

U.S. Geological Survey Library  
Box 25046  
Denver Federal Center, MS914  
Denver, CO 80225

*NASA CASI Price Tables — Effective January 1, 2000*

***Hardcopy & Microfiche Prices***

<i>Code</i>	<i>NASA</i>	<i>U.S.*</i>	<i>International*</i>
A01	\$9.50	\$9.50	\$19.00
A02	\$13.50	\$14.50	\$29.00
A03	\$24.50	\$27.50	\$55.00
A04	\$27.00	\$30.50	\$61.00
A05	\$28.50	\$32.50	\$65.00
A06	\$31.00	\$35.50	\$71.00
A07	\$34.50	\$39.50	\$79.00
A08	\$37.50	\$43.00	\$86.00
A09	\$42.50	\$49.00	\$98.00
A10	\$45.50	\$53.00	\$106.00
A11	\$48.50	\$56.50	\$113.00
A12	\$52.50	\$61.00	\$122.00
A13	\$55.50	\$65.00	\$130.00
A14	\$57.50	\$67.00	\$134.00
A15	\$59.50	\$69.50	\$139.00
A16	\$61.50	\$72.00	\$144.00
A17	\$63.50	\$74.50	\$149.00
A18	\$67.00	\$78.50	\$157.00
A19	\$69.00	\$81.00	\$162.00
A20	\$71.00	\$83.50	\$167.00
A21	\$73.00	\$86.00	\$172.00
A22	\$78.50	\$92.50	\$185.00
A23	\$80.50	\$95.00	\$190.00
A24	\$82.50	\$97.00	\$194.00
A25	\$84.50	\$99.50	\$199.00
A99	Contact NASA CASI		

***Exception Prices***

<i>Code</i>	<i>NASA</i>	<i>U.S.*</i>	<i>International*</i>
E01	\$102.50	\$121.00	\$242.00
E02	\$111.00	\$131.50	\$263.00
E03	\$120.50	\$143.00	\$286.00
E04	\$130.00	\$154.00	\$308.00
E05	\$139.50	\$165.50	\$331.00
E06	\$148.00	\$176.00	\$352.00
E07	\$157.50	\$187.00	\$374.00
E08	\$167.00	\$198.50	\$397.00
E09	\$175.50	\$209.00	\$418.00
E10	\$185.00	\$220.00	\$440.00
E11	\$194.50	\$231.50	\$463.00
E12	\$202.50	\$241.00	\$482.00
E13	\$212.00	\$252.50	\$505.00
E14	\$221.50	\$264.00	\$528.00
E15	\$231.00	\$275.50	\$551.00
E16	\$239.50	\$285.50	\$571.00
E17	\$249.00	\$297.00	\$594.00
E18	\$258.50	\$308.50	\$617.00
E19	\$267.00	\$318.50	\$637.00
E20	\$276.50	\$330.00	\$660.00
E21	\$286.00	\$341.50	\$683.00
E22	\$294.50	\$351.50	\$703.00
E23	\$304.00	\$363.00	\$726.00
E24	\$313.50	\$374.50	\$749.00
E99	Free	Free	Free

***NASA Prices:***

For NASA employees and contractors  
registered at NASA CASI.

***U.S. Prices: \*Shipping fees extra***

For users located within the U.S.

***International Prices: \*Shipping fees extra***

For users outside the U.S. and international  
within the U.S. embassies

***Service Fees***

***Shipping Fees: per item***

\$1.50 U.S.  
\$9.00 International

***Video Shipping Fees: per title***

\$3.50 U.S.  
\$11.00 International

***Express Service Surcharge: per item***

One day CASI processing & shipped FedEx or Airmail.  
\*This charge is in addition to the shipping fee.

\$15.00 U.S.  
\$30.00 International

***Fax Service Fees: per item up to 30 pages***

\$16.50 U.S.  
\$24.00 International

*NASA CASI Price Tables — Effective January 1, 2000*

***Video Prices (VHS)***

<i>Code</i>	<i>NASA</i>	<i>U.S.*</i>	<i>International*</i>
V01	\$19.50	\$20.00	\$40.00
V02	\$23.50	\$25.00	\$50.00
V03	\$31.50	\$35.00	\$70.00
V04	\$39.50	\$45.00	\$90.00
V05	\$47.50	\$55.00	\$110.00
V06	\$55.50	\$65.00	\$130.00
V07	\$63.50	\$75.00	\$150.00
V08	\$71.50	\$85.00	\$170.00

***Video Prices (Betacam SP) NTSC***

<i>Code</i>	<i>NASA</i>	<i>U.S.*</i>	<i>International*</i>
B01	\$71.50	\$85.00	\$170.00
B02	\$75.50	\$90.00	\$180.00
B03	\$83.50	\$100.00	\$200.00
B04	\$119.50	\$145.00	\$290.00
B05	\$135.50	\$165.00	\$330.00
B06	\$171.50	\$210.00	\$420.00
B07	\$207.50	\$255.00	\$510.00
B08	\$243.50	\$300.00	\$600.00

***Video Prices (Betacam SP) PAL***

<i>Code</i>	<i>NASA</i>	<i>U.S.*</i>	<i>International*</i>
B01	\$98.50	\$119.00	\$238.00
B02	\$164.50	\$201.00	\$402.00
B03	\$186.50	\$229.00	\$458.00
B04	\$223.50	\$275.00	\$550.00
B05	\$230.50	\$284.00	\$568.00
B06	\$237.50	\$293.00	\$586.00
B07	\$244.50	\$302.00	\$604.00
B07	\$252.50	\$312.00	\$624.00

***CD-ROM Prices***

<i>Code</i>	<i>NASA</i>	<i>U.S.*</i>	<i>International*</i>
C01	\$28.00	\$33.00	\$66.00
C02	\$36.50	\$44.00	\$88.00
C03	\$46.50	\$56.00	\$112.00
C04	\$54.00	\$66.00	\$132.00
C05	\$63.00	\$77.00	\$154.00
C06	\$72.00	\$88.00	\$176.00
C07	\$80.50	\$99.00	\$198.00
C08	\$90.50	\$111.00	\$222.00
C09	\$99.00	\$122.00	\$244.00
C10	\$108.00	\$133.00	\$266.00

***NASA Prices:***

For NASA employees and contractors  
registered at NASA CASI.

***U.S. Prices: \*Shipping fees extra***

For users located within the U.S.

***International Prices: \*Shipping fees extra***

For users outside the U.S. and international  
within the U.S. embassies

***Service Fees***

***Shipping Fees: per item***

\$1.50 U.S.

\$9.00 International

***Video Shipping Fees: per title***

\$3.50 U.S.

\$11.00 International

***Express Service Surcharge: per item***

One day CASI processing & shipped FedEx or Airmail.

\*This charge is in addition to the shipping fee.

\$15.00 U.S.

\$30.00 International

***Fax Service Fees: per item up to 30 pages***

\$16.50 U.S.

\$24.00 International

## **Federal Depository Library Program**

In order to provide the general public with greater access to U.S. Government publications, Congress established the Federal Depository Library Program under the Government Printing Office (GPO), with 53 regional depositories responsible for permanent retention of material, inter-library loan, and reference services. At least one copy of nearly every NASA and NASA-sponsored publication, either in printed or microfiche format, is received and retained by the 53 regional depositories. A list of the Federal Regional Depository Libraries, arranged alphabetically by state, appears at the very end of this section. These libraries are not sales outlets. A local library can contact a regional depository to help locate specific reports, or direct contact may be made by an individual.

## **Public Collection of NASA Documents**

An extensive collection of NASA and NASA-sponsored publications is maintained by the British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England for public access. The British Library Lending Division also has available many of the non-NASA publications cited in the STI Database. European requesters may purchase facsimile copy or microfiche of NASA and NASA-sponsored documents FIZ–Fachinformation Karlsruhe–Bibliographic Service, D-76344 Eggenstein-Leopoldshafen, Germany and TIB–Technische Informationsbibliothek, P.O. Box 60 80, D-30080 Hannover, Germany.

## **Submitting Documents**

All users of this abstract service are urged to forward reports to be considered for announcement in the STI Database. This will aid NASA in its efforts to provide the fullest possible coverage of all scientific and technical publications that might support aeronautics and space research and development. If you have prepared relevant reports (other than those you will transmit to NASA, DOD, or DOE through the usual contract- or grant-reporting channels), please send them for consideration to:

ATTN: Acquisitions Specialist  
NASA Center for AeroSpace Information  
7121 Standard Drive  
Hanover, MD 21076-1320.

Reprints of journal articles, book chapters, and conference papers are also welcome.

You may specify a particular source to be included in a report announcement if you wish; otherwise the report will be placed on a public sale at the NASA Center for AeroSpace Information. Copyrighted publications will be announced but not distributed or sold.

# Federal Regional Depository Libraries

## ALABAMA

### AUBURN UNIV. AT MONTGOMERY LIBRARY

Documents Dept.  
7300 University Dr.  
Montgomery, AL 36117-3596  
(205) 244-3650 Fax: (205) 244-0678

### UNIV. OF ALABAMA

Amelia Gayle Gorgas Library  
Govt. Documents  
P.O. Box 870266  
Tuscaloosa, AL 35487-0266  
(205) 348-6046 Fax: (205) 348-0760

## ARIZONA

### DEPT. OF LIBRARY, ARCHIVES, AND PUBLIC RECORDS

Research Division  
Third Floor, State Capitol  
1700 West Washington  
Phoenix, AZ 85007  
(602) 542-3701 Fax: (602) 542-4400

## ARKANSAS

### ARKANSAS STATE LIBRARY

State Library Service Section  
Documents Service Section  
One Capitol Mall  
Little Rock, AR 72201-1014  
(501) 682-2053 Fax: (501) 682-1529

## CALIFORNIA

### CALIFORNIA STATE LIBRARY

Govt. Publications Section  
P.O. Box 942837 - 914 Capitol Mall  
Sacramento, CA 94337-0091  
(916) 654-0069 Fax: (916) 654-0241

## COLORADO

### UNIV. OF COLORADO - BOULDER

Libraries - Govt. Publications  
Campus Box 184  
Boulder, CO 80309-0184  
(303) 492-8834 Fax: (303) 492-1881

### DENVER PUBLIC LIBRARY

Govt. Publications Dept. BSG  
1357 Broadway  
Denver, CO 80203-2165  
(303) 640-8846 Fax: (303) 640-8817

## CONNECTICUT

### CONNECTICUT STATE LIBRARY

231 Capitol Avenue  
Hartford, CT 06106  
(203) 566-4971 Fax: (203) 566-3322

## FLORIDA

### UNIV. OF FLORIDA LIBRARIES

Documents Dept.  
240 Library West  
Gainesville, FL 32611-2048  
(904) 392-0366 Fax: (904) 392-7251

## GEORGIA

### UNIV. OF GEORGIA LIBRARIES

Govt. Documents Dept.  
Jackson Street  
Athens, GA 30602-1645  
(706) 542-8949 Fax: (706) 542-4144

## HAWAII

### UNIV. OF HAWAII

Hamilton Library  
Govt. Documents Collection  
2550 The Mall  
Honolulu, HI 96822  
(808) 948-8230 Fax: (808) 956-5968

## IDAHO

### UNIV. OF IDAHO LIBRARY

Documents Section  
Rayburn Street  
Moscow, ID 83844-2353  
(208) 885-6344 Fax: (208) 885-6817

## ILLINOIS

### ILLINOIS STATE LIBRARY

Federal Documents Dept.  
300 South Second Street  
Springfield, IL 62701-1796  
(217) 782-7596 Fax: (217) 782-6437

## INDIANA

### INDIANA STATE LIBRARY

Serials/Documents Section  
140 North Senate Avenue  
Indianapolis, IN 46204-2296  
(317) 232-3679 Fax: (317) 232-3728

## IOWA

### UNIV. OF IOWA LIBRARIES

Govt. Publications  
Washington & Madison Streets  
Iowa City, IA 52242-1166  
(319) 335-5926 Fax: (319) 335-5900

## KANSAS

### UNIV. OF KANSAS

Govt. Documents & Maps Library  
6001 Malott Hall  
Lawrence, KS 66045-2800  
(913) 864-4660 Fax: (913) 864-3855

## KENTUCKY

### UNIV. OF KENTUCKY

King Library South  
Govt. Publications/Maps Dept.  
Patterson Drive  
Lexington, KY 40506-0039  
(606) 257-3139 Fax: (606) 257-3139

## LOUISIANA

### LOUISIANA STATE UNIV.

Middleton Library  
Govt. Documents Dept.  
Baton Rouge, LA 70803-3312  
(504) 388-2570 Fax: (504) 388-6992

### LOUISIANA TECHNICAL UNIV.

Prescott Memorial Library  
Govt. Documents Dept.  
Ruston, LA 71272-0046  
(318) 257-4962 Fax: (318) 257-2447

## MAINE

### UNIV. OF MAINE

Raymond H. Fogler Library  
Govt. Documents Dept.  
Orono, ME 04469-5729  
(207) 581-1673 Fax: (207) 581-1653

## MARYLAND

### UNIV. OF MARYLAND - COLLEGE PARK

McKeldin Library  
Govt. Documents/Maps Unit  
College Park, MD 20742  
(301) 405-9165 Fax: (301) 314-9416

## MASSACHUSETTS

### BOSTON PUBLIC LIBRARY

Govt. Documents  
666 Boylston Street  
Boston, MA 02117-0286  
(617) 536-5400, ext. 226  
Fax: (617) 536-7758

## MICHIGAN

### DETROIT PUBLIC LIBRARY

5201 Woodward Avenue  
Detroit, MI 48202-4093  
(313) 833-1025 Fax: (313) 833-0156

### LIBRARY OF MICHIGAN

Govt. Documents Unit  
P.O. Box 30007  
717 West Allegan Street  
Lansing, MI 48909  
(517) 373-1300 Fax: (517) 373-3381

## MINNESOTA

### UNIV. OF MINNESOTA

Govt. Publications  
409 Wilson Library  
309 19th Avenue South  
Minneapolis, MN 55455  
(612) 624-5073 Fax: (612) 626-9353

## MISSISSIPPI

### UNIV. OF MISSISSIPPI

J.D. Williams Library  
106 Old Gym Bldg.  
University, MS 38677  
(601) 232-5857 Fax: (601) 232-7465

## MISSOURI

### UNIV. OF MISSOURI - COLUMBIA

106B Ellis Library  
Govt. Documents Sect.  
Columbia, MO 65201-5149  
(314) 882-6733 Fax: (314) 882-8044

## MONTANA

### UNIV. OF MONTANA

Mansfield Library  
Documents Division  
Missoula, MT 59812-1195  
(406) 243-6700 Fax: (406) 243-2060

## NEBRASKA

### UNIV. OF NEBRASKA - LINCOLN

D.L. Love Memorial Library  
Lincoln, NE 68588-0410  
(402) 472-2562 Fax: (402) 472-5131

## NEVADA

### THE UNIV. OF NEVADA LIBRARIES

Business and Govt. Information Center  
Reno, NV 89557-0044  
(702) 784-6579 Fax: (702) 784-1751

## NEW JERSEY

### NEWARK PUBLIC LIBRARY

Science Div. - Public Access  
P.O. Box 630  
Five Washington Street  
Newark, NJ 07101-7812  
(201) 733-7782 Fax: (201) 733-5648

## NEW MEXICO

### UNIV. OF NEW MEXICO

General Library  
Govt. Information Dept.  
Albuquerque, NM 87131-1466  
(505) 277-5441 Fax: (505) 277-6019

### NEW MEXICO STATE LIBRARY

325 Don Gaspar Avenue  
Santa Fe, NM 87503  
(505) 827-3824 Fax: (505) 827-3888

## NEW YORK

### NEW YORK STATE LIBRARY

Cultural Education Center  
Documents/Gift & Exchange Section  
Empire State Plaza  
Albany, NY 12230-0001  
(518) 474-5355 Fax: (518) 474-5786

## NORTH CAROLINA

### UNIV. OF NORTH CAROLINA - CHAPEL HILL

Walter Royal Davis Library  
CB 3912, Reference Dept.  
Chapel Hill, NC 27514-8890  
(919) 962-1151 Fax: (919) 962-4451

## NORTH DAKOTA

### NORTH DAKOTA STATE UNIV. LIB.

Documents  
P.O. Box 5599  
Fargo, ND 58105-5599  
(701) 237-8886 Fax: (701) 237-7138

### UNIV. OF NORTH DAKOTA

Chester Fritz Library  
University Station  
P.O. Box 9000 - Centennial and University Avenue  
Grand Forks, ND 58202-9000  
(701) 777-4632 Fax: (701) 777-3319

## OHIO

### STATE LIBRARY OF OHIO

Documents Dept.  
65 South Front Street  
Columbus, OH 43215-4163  
(614) 644-7051 Fax: (614) 752-9178

## OKLAHOMA

### OKLAHOMA DEPT. OF LIBRARIES

U.S. Govt. Information Division  
200 Northeast 18th Street  
Oklahoma City, OK 73105-3298  
(405) 521-2502, ext. 253  
Fax: (405) 525-7804

### OKLAHOMA STATE UNIV.

Edmon Low Library  
Stillwater, OK 74078-0375  
(405) 744-6546 Fax: (405) 744-5183

## OREGON

### PORTLAND STATE UNIV.

Branford P. Millar Library  
934 Southwest Harrison  
Portland, OR 97207-1151  
(503) 725-4123 Fax: (503) 725-4524

## PENNSYLVANIA

### STATE LIBRARY OF PENN.

Govt. Publications Section  
116 Walnut & Commonwealth Ave.  
Harrisburg, PA 17105-1601  
(717) 787-3752 Fax: (717) 783-2070

## SOUTH CAROLINA

### CLEMSON UNIV.

Robert Muldrow Cooper Library  
Public Documents Unit  
P.O. Box 343001  
Clemson, SC 29634-3001  
(803) 656-5174 Fax: (803) 656-3025

### UNIV. OF SOUTH CAROLINA

Thomas Cooper Library  
Green and Sumter Streets  
Columbia, SC 29208  
(803) 777-4841 Fax: (803) 777-9503

## TENNESSEE

### UNIV. OF MEMPHIS LIBRARIES

Govt. Publications Dept.  
Memphis, TN 38152-0001  
(901) 678-2206 Fax: (901) 678-2511

## TEXAS

### TEXAS STATE LIBRARY

United States Documents  
P.O. Box 12927 - 1201 Brazos  
Austin, TX 78701-0001  
(512) 463-5455 Fax: (512) 463-5436

### TEXAS TECH. UNIV. LIBRARIES

Documents Dept.  
Lubbock, TX 79409-0002  
(806) 742-2282 Fax: (806) 742-1920

## UTAH

### UTAH STATE UNIV.

Merrill Library Documents Dept.  
Logan, UT 84322-3000  
(801) 797-2678 Fax: (801) 797-2677

## VIRGINIA

### UNIV. OF VIRGINIA

Alderman Library  
Govt. Documents  
University Ave. & McCormick Rd.  
Charlottesville, VA 22903-2498  
(804) 824-3133 Fax: (804) 924-4337

## WASHINGTON

### WASHINGTON STATE LIBRARY

Govt. Publications  
P.O. Box 42478  
16th and Water Streets  
Olympia, WA 98504-2478  
(206) 753-4027 Fax: (206) 586-7575

## WEST VIRGINIA

### WEST VIRGINIA UNIV. LIBRARY

Govt. Documents Section  
P.O. Box 6069 - 1549 University Ave.  
Morgantown, WV 26506-6069  
(304) 293-3051 Fax: (304) 293-6638

## WISCONSIN

### ST. HIST. SOC. OF WISCONSIN LIBRARY

Govt. Publication Section  
816 State Street  
Madison, WI 53706  
(608) 264-6525 Fax: (608) 264-6520

### MILWAUKEE PUBLIC LIBRARY

Documents Division  
814 West Wisconsin Avenue  
Milwaukee, WI 53233  
(414) 286-3073 Fax: (414) 286-8074

# Typical Report Citation and Abstract

- ❶ 19970001126 NASA Langley Research Center, Hampton, VA USA
- ❷ Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes
- ❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
- ❹ Mar. 1996; 130p; In English
- ❺ Contract(s)/Grant(s): RTOP 505-68-70-04
- ❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
- ❼ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10° to 50°, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65° swept forebody serrations tended to roll together, while vortices from 40° swept serrations were more effective in generating additional lift caused by their more independent nature.
- ❽ Author
- ❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

## Key

1. Document ID Number; Corporate Source
2. Title
3. Author(s) and Affiliation(s)
4. Publication Date
5. Contract/Grant Number(s)
6. Report Number(s); Availability and Price Codes
7. Abstract
8. Abstract Author
9. Subject Terms

---

# AEROSPACE MEDICINE AND BIOLOGY

---

*A Continuing Bibliography (Suppl. 502)*

JULY 2000

## 51

### LIFE SCIENCES (GENERAL)

*Includes general research topics related to plant and animal biology (non-human); ecology; microbiology; and also the origin, development, structure, and maintenance, of animals and plants in space and related environmental conditions. For specific topics in life sciences see categories 52 through 55.*

20000058173 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

#### Modeling the Activity of Single Genes

Mjolsness, Eric, Jet Propulsion Lab., California Inst. of Tech., USA; Gibson, Michael, California Inst. of Tech., USA; Apr. 19, 1999; 42p; In English

Contract(s)/Grant(s): N00014-97-1-0293; N00014-97-1-0422; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The central dogma of molecular biology states that information is stored in DNA, transcribed to messenger RNA (mRNA) and then translated into proteins. This picture is significantly augmented when we consider the action of certain proteins in regulating transcription. These transcription factors provide a feedback pathway by which genes can regulate one another's expression as mRNA and then as protein. to review: DNA, RNA and proteins have different functions. DNA is the molecular storehouse of genetic information. When cells divide, the DNA is replicated, so that each daughter cell maintains the same genetic information as the mother cell. RNA acts as a go-between from DNA to proteins. Only a single copy of DNA is present, but multiple copies of the same piece of RNA may be present, allowing cells to make huge amounts of protein. In eukaryotes (organisms with a nucleus), DNA is found in the nucleus only. RNA is copied in the nucleus then translocates(moves) outside the nucleus, where it is transcribed into proteins. Along the way, the RNA may be spliced, i.e., may have pieces cut out. RNA then attaches to ribosomes and is translated to proteins. Proteins are the machinery of the cell other than DNA and RNA, all the complex molecules of the cell are proteins. Proteins are specialized machines, each of which fulfills its own task, which may be transporting oxygen, catalyzing reactions, or responding to extracellular signals, just to name a few. One of the more interesting functions a protein may have is binding directly or indirectly to DNA to perform transcriptional regulation, thus forming a closed feedback loop of gene regulation. The structure of DNA and the central dogma were understood in the 50s; in the early 80s it became possible to make arbitrary modifications to DNA and use cellular machinery to transcribe and translate the resulting genes; more recently, genomes (i.e., the complete DNA sequence) of many organisms have been sequenced. This large-scale sequencing began with simple organisms, viruses and bacteria, progressed to eukaryotes such as yeast, and more recently (1998) progressed to a multi-cellular animal, the nematode *Caenorhabditis elegans*. Sequencers have now moved on to the fruit fly *Drosophila melanogaster*, whose sequence is slated for completion by the end of 1999. The human genome project is expected to determine the complete sequence of all 3 billion bases of human DNA within the next five years. In the wake of genome-scale sequencing, further instrumentation is being developed to assay gene expression and function on a comparably large scale. Much of the work in computational biology focuses on computational tools used in sequencing, finding genes that are related to a particular gene, finding which parts of the DNA code for proteins and which do not, understanding what proteins will be formed from a given length of DNA, predicting how the proteins will fold from a one-dimensional structure into a three dimensional structure, and so on. Much less computational work has been done regarding the function of proteins. One reason for this is that different proteins function very differently, and so work on protein function is very specific to certain classes of proteins. There are, for example, proteins such enzymes that catalyze various intracellular reactions, receptors that respond to extracellular signals and ion channels that regulate the flow of charged particles into and out of the cell. In this chapter, we will consider a particular class of proteins called transcription factors(TFs), which are responsible for regulating when a certain gene is expressed in a certain cell, which cells it is express in, and how much is expressed. Understanding these processes will involve developing a deeper understanding of transcription, translation, and the cellular processes that control those processes. All of these elements fall under the aegis of gene regulation or more narrowly transcriptional regulation. Some of the key questions in gene regulation are: What genes are

expressed in a certain cell at a certain time? How does gene expression differ from cell to cell in a multicellular organism? Which proteins act as transcription factors, i.e., are important in regulating gene expression? From questions like these, we hope to understand which genes are important for various macroscopic processes. Nearly all of the cells of a multicellular organism contain the same DNA. Yet this same genetic information yields a large number of different cell types. The fundamental difference between a neuron and a liver cell, for example, is which genes are expressed. Thus understanding gene regulation is an important step in understanding development. Furthermore, understanding the usual genes that are expressed in cells may give important clues about various diseases. Some diseases, such as sickle cell anemia and cystic fibrosis, are caused by defects in single, non-regulatory genes; others, such as certain cancers, are caused when the cellular control circuitry malfunctions - an understanding of these diseases will involve pathways of multiple interacting gene products. There are numerous challenges in the area of understanding and modeling gene regulation. First and foremost, biologists would like to develop a deeper understanding of the processes involved, including which genes and families of genes are important, how they interact, etc. From a computation point of view, there has been embarrassingly little work done. In this chapter there are many areas in which we can phrase meaningful, non-trivial computational questions, but questions that have not been addressed. Some of these are purely computational (what is a good algorithm for dealing with a model of type X) and others are more mathematical (given a system with certain characteristics, what sort of model can one use? How does one find biochemical parameters from system-level behavior using as few experiments as possible?). In addition to biological and algorithmic problems, there is also the ever-present issue of theoretical biology - what general principles can be derived from these systems, what can one do with models other than just simulate time-courses, what can be deduced about a class of systems without knowing all the details? The fundamental challenge to computationalists and theorists is to add value to the biology - to use models, modeling techniques and algorithms to understand the biology in new ways.

Derived from text

*Genetics; Bioengineering; Genes; Deoxyribonucleic Acid; Ribonucleic Acids; Molecular Biology; Biochemistry; Gene Expression; Sequencing; Proteins*

20000064567 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

**Investigating the Relationship Between Liquid Water and Leaf Area in Clonal Populus**

Roberts, Dar, California Univ., USA; Brown, K., Washington Univ., USA; Green, R., Jet Propulsion Lab., California Inst. of Tech., USA; Ustin, S., California Univ., USA; Hinckley, T., Washington Univ., USA; Summaries of the Seventh JPL Airborne Earth Science Workshop January 12-16, 1998; Dec. 19, 1998; Volume 1, pp. 335-344; In English; See also 20000064520

Contract(s)/Grant(s): W/GEC95-062A; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Leaf Area Index (LAI) is one of the most commonly employed biophysical parameters used to characterize vegetation canopies and scale leaf physiological processes to larger scales. For example, LAI is a critical parameter used in regional scale estimates of evapotranspiration, photosynthesis, primary productivity, and carbon cycling (Running et al., 1989; Dorman and Sellers, 1989; Potter et al., 1993). LAI is typically estimated using ratio-based techniques, such as the Normalized Difference Vegetation Index (NDVI: e.g. Tucker 1979; Asrar et al., 1989; Sellers 1985, 1987). The physical basis behind this relationship depends on the high spectral contrast between scattered near-infrared (NIR) and absorbed red radiation in canopies. As the number of leaves present in a canopy increases over a unit area, NIR reflectance increases, while red reflectance decreases, resulting in an increase in the ratio. Through time series and image compositing, NDVI provides an additional temporal measure of how these parameters change, providing a means to monitor fluxes and productivity (Tucker et al., 1983). NDVI, while highly successful for agriculture and grassland ecosystems has been found to be less successful in evergreen chaparral and forested ecosystems (Badhwar et al., 1986; Gamon et al., 1993; Hall et al., 1995). Typically, the relationship between NDVI and LAI becomes progressively more asymptotic at LAI values above three (Sellers, 1985), although linear relationships have been observed in conifers at LAIs as high as 13 (Spanner et al., 1990). In this paper, we explore an alternative approach for estimating LAI for remotely sensed data from AVIRIS based on estimates of canopy liquid water. Our primary objective is to test the hypothesis that the depth of the liquid water bands expressed in canopy reflectance spectra at 960, 1200, 1400 and 1900 nm increases with increasing LAI in canopies. This study builds from work by Roberts et al. (1997), in which liquid water was shown to increase following a gradient of increasing LAI ranging from grasslands to coniferous forests. In that study, it was observed that forests, which showed little variation in NDVI, showed significant variation in liquid water. In order to test this hypothesis, we analyzed field spectra measured over Populus resprouts of known LAI and monitored changes in liquid water in young Populus stands as they aged over a 4-year time span. The study was conducted in south-central Washington, in a clonal Populus fiber farm owned and operated by Boise-Cascade near the town of Wallula.

Derived from text

*Canopies (Vegetation); Chaparral; Leaf Area Index; Remote Sensing; Moisture Content; Spectral Reflectance*

20000064603 NASA Ames Research Center, Moffett Field, CA USA

**Molecular Simulations in Astrobiology**

Pohorille, Andrew, NASA Ames Research Center, USA; Wilson, Michael A., NASA Ames Research Center, USA; Schweighofer, Karl, NASA Ames Research Center, USA; Chipot, Christophe, NASA Ames Research Center, USA; New, Michael H., NASA Ames Research Center, USA; February 2000; In English; See also 20000064579; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

One of the main goals of astrobiology is to understand the origin of cellular life. The most direct approach to this problem is to construct laboratory models of protocells. Such efforts, currently underway in the NASA Astrobiology Program, are accompanied by computational studies aimed at explaining self-organization of simple molecules into ordered structures that are capable of performing protocellular functions. Many of these functions, such as importing nutrients, capturing energy and responding to changes in the environment, are carried out by proteins bound to membranes. We use computer simulations to address the following questions about these proteins: (1) How do small proteins self-organize into ordered structures at water-membrane interfaces and insert into membranes? (2) How do peptides form membrane-spanning structures (e.g. channels)? (3) by what mechanisms do such structures perform their functions? The simulations are performed using the molecular dynamics method. In this method, Newton's equations of motion for each atom in the system are solved iteratively. At each time step, the forces exerted on each atom by the remaining atoms are evaluated by dividing them into two parts. Short-range forces are calculated in real space while long-range forces are evaluated in reciprocal space, using a particle-mesh algorithm which is of order  $O(N \ln N)$ . With a time step of 2 femtoseconds, problems occurring on multi-nanosecond time scales ( $10(\exp 6)$ - $10(\exp 8)$  time steps) are accessible. To address a broader range of problems, simulations need to be extended by three orders of magnitude, which requires algorithmic improvements and codes scalable to a large number of processors. Work in this direction is in progress. Two series of simulations are discussed. In one series, it is shown that nonpolar peptides, disordered in water, translocate to the nonpolar interior of the membrane and fold into helical structures (see Figure). Once in the membrane, the peptides exhibit orientational flexibility with changing conditions, which may have provided a mechanism of transmitting signals between the protocell and its environment. In another series of simulations, the mechanism by which a simple protein channel efficiently mediates proton transport across membranes was investigated. This process is a key step in cellular bioenergetics. In the channel under study, proton transport is gated by four histidines that occlude the channel pore. The simulations identify the mechanisms by which protons move through the gate.

Author

*Computerized Simulation; Exobiology; Protobiology; Chemical Evolution; Organic Compounds; Cell Membranes (Biology)*

20000068431 NASA Marshall Space Flight Center, Huntsville, AL USA

**Effect of Electrical Stimulation on Beta-Adrenergic Receptor Population and Cyclic AMP Production in Chicken and Rat Skeletal Muscle Cell Cultures**

Young, Ronald B., NASA Marshall Space Flight Center, USA; Bridge, Kristin Y., NASA Marshall Space Flight Center, USA; Strietzel, Catherine J., Alabama Univ., USA; In Vitro Cellular and Development Biology - Animal; March 2000; ISSN 1071-2690; Volume 36, pp. 167-173; In English

Contract(s)/Grant(s): NIH-AR-42719; Copyright; Avail: Issuing Activity

Expression of the beta-adrenergic receptor (PAR) and its coupling to Adenosine 3'5' Cyclic Monophosphate (cAMP) synthesis are important components of the signaling system that controls muscle atrophy and hypertrophy and the goal of this study was to determine if electrical stimulation in a pattern simulating slow muscle contraction would alter the PAR response in primary cultures of avian and mammalian skeletal muscle cells. Specifically chicken skeletal muscle cells and rat skeletal muscle cells that had been grown for 7 d in culture, were subjected to electrical stimulation for an additional 2 d at a pulse frequency of 0.5 pulses/sec and a pulse duration of 200 msec. In chicken skeletal muscle cells, the PAR population was not significantly affected by electrical stimulation; however, the ability of these cells to synthesize cyclic AMP was reduced by approximately one-half. In contrast, the PAR population in rat muscle cells was increased slightly but not significantly by electrical stimulation, and the ability of these cells to synthesize cyclic AMP was increased by almost twofold. The basal levels of intracellular cyclic AMP in neither rat muscle cells nor chicken muscle cells were affected by electrical stimulation.

Author

*Adrenergics; Chickens; Musculoskeletal System; Rats; Culture Techniques; Cells (Biology); Electric Stimuli; Cyclic Amp*

20000068516 Bionetics Corp., Moffett Field, CA USA

**Mineral Nutrition of Plants, Chapter 9**

Wignarajah, Kanapathipillai, Bionetics Corp., USA; Handbook of Plant and Crop Physiology; [1995], pp. 193-221; In English; Copyright; Avail: Issuing Activity

The ultimate source of nutrients for all living organisms consists of the inanimate nutrient reserves found on earth. of the elements known to exist, seven are considered essential to plants in large amounts (macronutrients), and many others are required in smaller quantities (micronutrients). Essentiality of a nutrient is defined according to the following concepts: (a) A deficiency of the element makes it impossible for the plant to complete the vegetative or reproductive stage of its cycle; (b) such deficiency is specific to the element in question and can be prevented or corrected only by supplying this element; (c) the element is directly involved in the nutrition of the plant quite apart from its possible effects in correcting some unfavorable microbiological or chemical condition of the soil or other culture medium. From that standpoint a favorable response from adding a given element to the culture medium does not constitute conclusive evidence of its indispensability in plant nutrition. All the elements occurring in the outer part of the earth are in constant turnover among the different components of earth. This overall migration is referred to as geochemical cycling. When cycling includes a role for biological organisms, it is referred to as "biogeochemical cycling." Like most cyclical processes in nature, the biogeochemical cycling of elements is not continuous, nor does it proceed in a well-defined direction. At stages, it may be halted or short-circuited, or it may change. Any changes will eventually impact the survival, evolution, and development of biological species in the system. The relationship of the various systems is represented in a schematic manner. To assess the efficiency of operation of the biogeochemical cycles, it is important to include both natural and human activities. Often reliable values on use by man are difficult to obtain for a number of reasons, such as lack of international cooperation, and lack of proper bookkeeping and auditing by individual nations. However, a general estimate of the annual world consumption of elements and their compounds is presented.

Derived from text

*Minerals; Organisms; Nutrition; Biogeochemistry; Plants (Botany)*

20000069788 NASA Ames Research Center, Moffett Field, CA USA

**Metabolic Cages for a Space Flight Model in the Rat**

Harper, Jennifer S., NASA Ames Research Center, USA; Mulenburg, Gerald M., NASA Ames Research Center, USA; Evans, Juli, NASA Ames Research Center, USA; Navidi, Meena, NASA Ames Research Center, USA; Wolinsky, Ira, Houston Univ., USA; Arnaud, Sara B., NASA Ames Research Center, USA; Laboratory Animal Science; December 1994, pp. 645-647; In English

Contract(s)/Grant(s): RTOP 199-26-12-02; Copyright; Avail: Issuing Activity

A variety of space flight models are available to mimic the physiologic changes seen in the rat during weightlessness. The model reported by Wronski and Morey-Holton has been widely used by many investigators, in musculoskeletal physiologic studies especially, resulting in accumulation of an extensive database that enables scientists to mimic space flight effects in the 1-g environment of Earth. However, information on nutrition or gastrointestinal and renal function in this space flight model is limited by the difficulty in acquiring uncontaminated metabolic specimens for analysis. In the Holton system, a traction tape harness is applied to the tail, and the rat's hindquarters are elevated by attaching the harness to a pulley system. Weight-bearing hind limbs are unloaded, and there is a headward fluid shift. The tail-suspended rats are able to move freely about their cages on their forelimbs and tolerate this procedure with minimal signs of stress. The cage used in Holton's model is basically a clear acrylic box set on a plastic grid floor with the pulley and tail harness system attached to the open top of the cage. Food is available from a square food cup recessed into a corner of the floor. In this system, urine, feces, and spilled food fall through the grid floor onto absorbent paper beneath the cage and cannot be separated and recovered quantitatively for analysis in metabolic balance studies. Commercially available metabolic cages are generally cylindrical and have been used with a centrally located suspension apparatus in other space flight models. The large living area, three times as large as most metabolic cages, and the free range of motion unique to Holton's model, essential for musculoskeletal investigations, were sacrificed. Holton's cages can accommodate animals ranging in weight from 70 to 600 g. Although an alternative construction of Holton's cage has been reported, it does not permit collection of separate urine and fecal samples. We describe the modifications to Holton's food delivery system, cage base, and the addition of a separator system for the collection of urine and fecal samples for metabolic and nutrition studies in the tail suspension model.

Derived from text

*Metabolism; Physiology; Rats; Weightlessness; Test Facilities; Research Facilities; Bioastronautics*

20000070351 Illinois Univ., Dept. of Molecular and Integrative Physiology, Urbana, IL USA

**Structure-Function Studies of Native and Recombinant Fish Antifreeze Proteins** *Final Report, 1 Mar. 1995 - 31 Feb. 1998*

Cheng-DeVries, Chi-Hing C.; DeVries, Arthur L.; Mar. 16, 2000; 12p; In English

Contract(s)/Grant(s): F49620-95-1-0205

Report No.(s): AD-A376060; AFRL-SR-BL-TR-00-0113; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This project investigates the structures of several fish antifreeze proteins, and how they interact with ice crystals and inhibit ice growth. Formation of hexagonal pit formation on ice crystal basal plane in the presence of fish antifreeze proteins was examined with two-photon fluorescence imaging which showed binding of antifreeze glycoproteins molecules on pit faces; the origin of pit development presumably stems from antifreeze adsorption on dislocations on the basal plane. A novel ice-active protein was isolated from AFGP-bearing notothenioid fish and its partial structure was determined. This protein and AFGP together lead to synergistic augmentation of antifreeze activity and thus has potential bearing on the design of more potent anti-freezing systems. A putative new type of antifreeze peptide was isolated from an Arctic lipid fish and its partial sequence was determined. and lastly, the X-ray crystallographic structure of a type III antifreeze peptide from an Antarctic eel pout and the protein's ice-binding surface were determined.

DTIC

*Antifreezes; Proteins; Crystal Structure*

20000070363 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

**Physical Control of Biological Productivity Off the Coast of Peru During the 1997-1998 El Nino**

Carr, Mary-Elena, Jet Propulsion Lab., California Inst. of Tech., USA; Climate Variability Program; April 1999, pp. 9; In English; See also 20000070362; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Satellite observations and an ecosystem model are used to understand the variability in the planktonic ecosystem off Peru for the period January 1996 to May 1998. The objective of this study is to quantify the changes in the ecosystem components, carbon pathways, and available food for small pelagic fish that occur associated with the change in physical forcing due to El Nino. Two periods are distinguished based on the observed sea level anomaly: a La Nina (LaN) period (1996) in which sea level was below normal and El Nino (EN), the average conditions for December 1997, in which the sea level was anomalously high. There are three phytoplankton size classes (pico-, nano-, and net-phytoplankton) which compete for nutrients and are eaten by three zooplankton size classes. The ecosystem model is forced by alongshore wind speed measured by the NASA Scatterometer (NSCAT) and the European Remote-sensing Satellites (ERS-1 and ERS-2). Larger, slower growing organisms are more sensitive to physical disturbance than smaller organisms (Carr, 1998]. In the present simulation as well, the primary effect of the El Nino (reduced nutrient supply, and increased temperature) is to reduce the biomass of large cells (netphytoplankton) and consequently of the zooplankton that rely on large cells as food source. EN conditions are accompanied by a rearrangement of carbon pathways: comparable uptake goes into reduced biomass accumulation, increased losses to respiration, reduced carbon export, and much reduced carbon available to fish. The star indicates the remotely sensed biomass (assuming a constant carbon to chlorophyll ratio of 60) as measured by the Ocean Color and Temperature Sensor (Nov.-Dec. 1996) and the Sea-viewing Wide Field-of-view Sensor (Dec. 1997). The model, which assumes no light limitation, overestimates total phytoplankton biomass. Additional Information is contained in the original.

Author

*Ecosystems; El Nino; Peru; Phytoplankton; Sea Level; Climate Change*

## 52

### AEROSPACE MEDICINE

*Includes the biological and physiological effects of atmospheric and space flight (weightlessness, space radiation, acceleration, and altitude stress) on the human being; and the prevention of adverse effects on those environments. For psychological and behavioral effects of aerospace environments see 53 Behavioral Science. For the effects of space on animals and plants see 51 Life Sciences.*

20000061488 Jackson (Henry M.) Foundation, Rockville, MD USA

**Stress-Induced Neurodegeneration: Mechanisms and Interventions** *Annual Report, 1 Jan. - 31 Dec. 1999*

Meyerhoff, James L.; Jan. 2000; 48p; In English

Contract(s)/Grant(s): DAMD17-98-1-8634

Report No.(s): AD-A377128; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Soldiers face a broad range of occupational/environmental threats which are hazardous to central nervous system (CNS) function. One of these, exposure to prolonged, extreme stress, has been recently associated with neuronal loss. Vietnam veterans with PTSD have decreased hippocampal volume on MRI, as well as decreased scores on standardized tests of memory. Short term (recent) memory function has been localized to the hippocampus. Humans exposed to extreme stress for sustained periods have suffered deterioration of memory and inability to concentrate, as well as CNS atrophy. chronic stress in several species, including mouse, rat, tree shrew and monkey, have been reported to develop alterations in hippocampal morphology, including apical dendritic atrophy, depletion of vesicles in mossy fiber terminals, as well as actual loss of neurons. A number of stress-induced

molecular pathophysiological mechanisms leading to neuronal loss/dysfunction have been described, including: (1) excessive release of excitatory amino acids (in particular, glutamate), leading to massive influx of extracellular calcium into neurons; (2) excessive release of adrenal glucocorticoids, which exacerbates the effect of excitatory amino acids. We have successfully characterized acute social defeat in the mouse as a model for eliciting high plasma levels of adrenal glucocorticoids, inducing high levels of stress and persistent avoidance behavior, as well as increased brain regional levels of mRNA for corticotrophin-releasing hormone and decreased hippocampal levels of mRNA for brain-derived neurotrophic factor BDNF. We will characterize the hippocampal neuronal changes induced in this paradigm, and then after chronic stress attempt to block them with a range of pharmaceutical interventions, including neurosteroids, antagonists to CRH and antagonists to excitatory amino acids.

DTIC

*Stress (Physiology); Central Nervous System; Adrenal Gland; Aerospace Medicine; Hippocampus; Atrophy*

20000062012 NASA Langley Research Center, Hampton, VA USA

*Aerospace Medicine and Biology: A Continuing Bibliography with Indexes, Supplement 501*

June 2000; 39p; In English

Report No.(s): NASA/SP-2000-7011/SUPPL501; NAS 1.21:7011/SUPPL501; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report lists reports, articles and other documents recently announced in the NASA STI Database.

Derived from text

*Aerospace Medicine; Bibliographies; Indexes (Documentation)*

20000062717 Joint Inst. for Nuclear Research, Div. of Radiation and Radiobiological Research, Dubna, USSR

*Induction of aberrations in human lymphocytes by (gamma)-rays and fast heavy ions*

Govorun, R. D.; Repin, M. V.; Krasavin, E. A.; Lukasova, E.; Kozubek, S.; Dec. 31, 1998; 23p; In English

Report No.(s): DE99-607972; JINR-E-19-98-31; No Copyright; Avail: Department of Energy Information Bridge

Frequencies of aberrations induced by different doses of (gamma)-rays and (sup 14)N ions (LET (approx) 77 keV/(mu)m) in the chromosomes 1 and 2 of human lymphocytes as detected by FISH were compared with those detected by conventional staining in the whole genome. The results have shown that the induction of aberrations in the chromosomes 1 and 2 is more frequent than that in the rest of genome. The frequencies of dicentrics detected by FISH in the chromosomes 1 and 2 recalculated for the whole genome are in good agreement with those detected by conventional staining at different doses of (sup 14)N, but they are about 2 times lower at low doses of (gamma)-rays. Translocation frequencies calculated in the same manner from the frequencies induced in the chromosome 1 by (gamma)-rays correspond to the frequencies of dicentrics detected by conventional staining, however, they are about 2 times higher than those detected by conventional staining at doses lower than 2 Gy of (sup 14)N. The differences between the frequencies of these aberration types increase at higher doses of both radiation types.

NTIS

*Aberration; Lymphocytes; Aerospace Medicine*

20000062935 Geological Survey, Biological Resources Div., Columbia, MO USA

*Development of physiological and Behavioral Measures of Acute Chemical Neurotoxicity Final Report, 8 Jan. 1997 - 7 Jan. 2000*

Jones, Susan B.; Little, Edward; Jan. 2000; 161p; In English

Contract(s)/Grant(s): MIPR-H3BM7721

Report No.(s): AD-A376880; No Copyright; Avail: CASI; A02, Microfiche; A08, Hardcopy

US military personnel may be exposed to a wide variety of potentially toxic chemicals. The chemicals personnel may encounter, particularly in combat situations, often are neurotoxicants. Predeployment screening methods such as behavioral and physiological measurements can be used to rapidly assess these potential health hazards. The objectives of this research were: (1) to develop and use computer aided methods in evaluation of neurotoxicity; (2) to evaluate physiological and behavioral endpoints of neurotoxicity in fish following exposure to the organophosphates malathion and diazinon; a carbamate, carbaryl; a metal, cadmium; a polycyclic aromatic hydrocarbon, pyrene; a biocide, fenvalerate; and a simulated semi-permeable membrane device mixture, malathion and fenvalerate; and, to assess the correlation between physiology and behavior; (3) to adapt neurotoxic methods for use with passive sentinel monitoring devices; and (4) to provide instrumental protocols, standardized operating procedures, and quality control for neurotoxicity monitoring. These objectives were achieved. Results indicated strong correlations between behavioral indices and brain cholinesterase activity when animals were exposed to traditional cholinesterase

inhibitors. Correlations with other chemicals were less clear and indicate the need for mechanistic studies associated with other chemical classes that may be important to military personnel.

DTIC

*Physiology; Behavior; Toxicity; Computer Aided Design; Neurology; Aerospace Medicine*

20000063382 NASA Ames Research Center, Moffett Field, CA USA

**Drinking-Induced Plasma Vasopressin and Norepinephrine Changes in Dehydrated Humans**

Geelen, Ghislaine, NASA Ames Research Center, USA; Greenleaf, John E., NASA Ames Research Center, USA; Keil, Lanny C., NASA Ames Research Center, USA; *Journal of Clinical Endocrinology and Metabolism*; 1996; ISSN 0021-972X; Volume 81, No. 6, pp. 2131-2135; In English

Contract(s)/Grant(s): RTOP 199-18-12-07; Copyright; Avail: Issuing Activity

After 24-h water deprivation, five men (23-41 yr; 78 +/- 3.6 kg) consumed, within 4.0-6.2 min, 12 mL/kg of one of six fluid formulations (16.5 C) once a week over a period of 6 weeks: water, hypotonic saline (0.045% Na(+)), isotonic saline (0.36% Na(+)), hypertonic glucose 9.7%, glucose), and two commercial mildly hypertonic 9.7% carbohydrate drinks. Blood samples were drawn 5 min before and: 3, 9, 15, 30, and 70 min after completion of drinking. Ingestion induced no significant change in plasma Na(+), K(+), osmotic, or protein concentrations, blood pressure; or heart rate. Plasma volume (PV) was increased (P is less than 0.05) between 30-70 min with isotonic saline and the two commercial drinks. Ingestion induced a decrease in plasma AVP (PAVP) at 3 min, which was maximal (P is less than 0.05) at 15 min with all drinks. Thus, the act of drinking, independent of the composition or osmolality of the fluid absorbed, leads to a prompt inhibition of PAVP secretion in man. With the exception of rehydration with isotonic saline, this prompt response was followed by a long lasting inhibition of PAVP. There was no change in PRA, plasma aldosterone, atrial natriuretic peptide, or epinephrine, but an increase in plasma norepinephrine occurred immediately after ingestion, which suggests, like that for PAVP depression, a drinking-stimulate neural mechanism.

Author

*Drinking; Water Deprivation; Plasmas (Physics); Antidiuretics; Norepinephrine; Dehydration; Human Beings*

20000063383 NASA Ames Research Center, Moffett Field, CA USA

**Exercise and Human Immunodeficiency Virus (HIV-1) Infection**

Lawless, DeSales, Rockefeller Univ., USA; Jackson, Catherine G. R., University of Northern Colorado, USA; Greenleaf, John E., NASA Ames Research Center, USA; *Sports Medicine*; 1995; ISSN 0112-1642; Volume 19, No. 4, pp. 235-239; In English  
Contract(s)/Grant(s): NAG8-227; RTOP 199-18-12-07; Copyright; Avail: Issuing Activity

The human immune system is highly efficient and remarkably protective when functioning properly. Similar to other physiological systems, it functions best when the body is maintained with a balanced diet, sufficient rest and a moderately stress-free lifestyle. It can be disrupted by inappropriate drug use and extreme emotion or exertion. The functioning of normal or compromised immune systems can be enhanced by properly prescribed moderate exercise conditioning regimens in healthy people, and in some human immunodeficiency virus (HIV-1)-infected patients but not in others who unable to complete an interval training program. Regular exercise conditioning in healthy people reduces cardiovascular risk factors, increases stamina, facilitates bodyweight control, and reduces stress by engendering positive feelings of well-being. Certain types of cancer may also be suppressed by appropriate exercise conditioning. Various exercise regimens are being evaluated as adjunct treatments for medicated patients with the HIV-1 syndrome. Limited anecdotal evidence from patients suggests that moderate exercise conditioning is per se responsible for their survival well beyond expectancy. HIV-1-infected patients respond positively, both physiologically and psychologically, to moderate exercise conditioning. However, the effectiveness of any exercise treatment programme depends on its mode, frequency, intensity and duration when prescribed to complement the pathological condition of the patient. The effectiveness of exercise conditioning regimens in patients with HIV-1 infection is reviewed in this article. In addition, we discuss mechanisms and pathways, involving the interplay of psychological and physiological factors, through which the suppressed immune system can be enhanced. The immune modulators discussed are endogenous opioids, cytokines, neurotransmitters and other hormones. Exercise conditioning treatment appears to be more effective when combined with other stress management procedures.

Author

*Human Immunodeficiency Virus; Acquired Immunodeficiency Syndrome; Immune Systems; Infectious Diseases; Physical Exercise*

20000063522 Civil Aeromedical Inst., Oklahoma City, OK USA

**A Novel Method for the Determination of Sildenafil (Viagra(Registered Trademark)) and its Metabolite (UK-103,320) in Postmortem Specimens Using LC/MS/MS and LC/MS/MS/MS *Final Report***

Lewis, Russell J., Civil Aeromedical Inst., USA; Johnson, Robert D., Oklahoma Univ., USA; Blank, C. LeRoy, Oklahoma Univ., USA; May 2000; 20p; In English

Contract(s)/Grant(s): AM-B-98-TOX-202

Report No.(s): DOT/FAA/AM-00/20; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

During the investigation of aviation accidents, postmortem samples from victims are submitted to the FAA's Civil Aeromedical Institute for drug analysis. Because new drugs are continually being released to the market, it is our laboratory's responsibility to develop methods which can identify these new drugs. This paper presents a rapid and reliable method for the identification and quantitation of sildenafil (Viagra(R)) and its metabolite, UK-103,320. Sildenafil, when used properly, is relatively safe. There are, however, certain side effects that could create potential hazards. For example, Sildenafil has been shown to potentiate the hypotensive effects of nitrates commonly employed in the treatment of certain heart conditions. The procedure described herein incorporates solid-phase extraction and LC/MS/MS and MS/MS/MS utilizing an atmospheric pressure chemical ionization (APCI) ion trap mass spectrometer (MS) in the positive ionization (PCI) mode. Solid-phase extraction provided an efficient sample extraction yielding recoveries of approximately 80%. This method is highly selective and sensitive, having a limit of detection of 1 ng/mL for both compounds. Sildenafil and UK-103,320 were found to have a linear dynamic range of 2-800 ng/mL and 4-800 ng/mL, respectively. This procedure showed intra- day (within day) relative error of less than or = 6% and relative standard deviation (RSD) within 4% for both the 50 ng/mL and 200 ng/mL controls. The inter-day (between day) relative errors were less than or = 6% while the RSD was within 12% for both control concentrations. Sildenafil and UK-103,320 were found to be stable in blood for at least one week at 4 C. This method was also used for the determination of sildenafil and UK-103,320 in postmortem fluid and tissue specimens collected from fatal aviation accident victims.

Author

*Drugs; Blood; Dynamic Range; Extraction; Hazards; Heart; Hypotension; Metabolites*

20000064015 Institute for Human Factors TNO, Soesterberg, Netherlands

**The Assessment of Aftereffects of Real and Simulated Self Motion: Motion Sickness and Other Symptoms *Interim Report***

Wertheim, A. H., Institute for Human Factors TNO, Netherlands; Nov. 15, 1999; 50p; In English

Contract(s)/Grant(s): A98/KLu/310; TNO Proj. 789.2

Report No.(s): TD-99-0364; TM-99-A074; Copyright; Avail: Issuing Activity

After having spent some time in a simulator subjects often suffer from disturbing aftereffects. For a large part these consist of a continuation of motion sickness symptoms, but other symptoms, such as postural and visual problems are often reported as well. As a first step towards finding methods of reducing the risks associated with these symptoms (e.g. interference with everyday activities following a simulator trial), a literature review is provided, in which the most frequently used methods for assessing the magnitude of these aftereffects, are evaluated. Recommendations are given as to which methods are likely to be the best assessment tools, and as to what questions remain to be answered in future research.

Author

*Motion Sickness; Signs and Symptoms; Biological Effects*

20000064079 NASA Ames Research Center, Moffett Field, CA USA

**Mechanism of Thirst Attenuation During Head-Out Water Immersion in Men**

Wada, F., NASA Ames Research Center, USA; Sagawa, S., NASA Ames Research Center, USA; Miki, K., NASA Ames Research Center, USA; Nagaya, K., NASA Ames Research Center, USA; Nakamitsu, S., NASA Ames Research Center, USA; Shiraki, K., NASA Ames Research Center, USA; Greenleaf, J. E., NASA Ames Research Center, USA; [1994]; 9p; In English

Contract(s)/Grant(s): Proj. 03454138; RTOP 199-18-12-07; Copyright; Avail: Issuing Activity

The purpose was to determine whether extracellular volume or osmolality was the major contributing factor for reduction of thirst in air and head-out water immersion in hypohydrated subjects. Eight males (19 - 25 yr) were subjected to thermoneutral immersion and thermoneutral air under two hydration conditions without further drinking: euhydration in water (Eu-H<sub>2</sub>O) and euhydration in air, and hypohydration in water (Hypo-H<sub>2</sub>O) and hypohydration in air (3.7% wt loss after exercise in heat). The increased thirst sensation with Hypo-H<sub>2</sub>O decreased (P less than 0.05) within 10 min of immersion and continued thereafter. Mean plasma osmolality (288 +/- 1 mosmol/kg H<sub>2</sub>O) and sodium (140 +/- 1 meq/l) remained elevated, and plasma volume increased by 4.2 +/- 1.0% (P less than 0.05) throughout Hypo-H<sub>2</sub>O. A sustained increase (P less than 0.05) in stroke volume accompanied the prompt and sustained decrease in plasma renin activity and sustained increase (P less than 0.05) in plasma atrial natriuretic peptide during Eu-H<sub>2</sub>O and Hypo-H<sub>2</sub>O. Plasma vasopressin decreased from 5.3 +/- 0.7 to 2.9 +/- 0.5 pg/ml (P less than 0.05)

during Hypo-H<sub>2</sub>O but was unchanged in Eu-H<sub>2</sub>O. These findings suggest a sustained stimulation of the atrial baroreceptors and reduction of a dipsogenic stimulus without major alterations of extracellular osmolality in Hypo-H<sub>2</sub>O. Thus it appears that vascular volume induced stimuli of cardiopulmonary baroreceptors play a more important role than extracellular osmolality in reducing thirst sensations during immersion in hypohydrated subjects. Thus the purpose for this study was to determine the relative importance of volume and osmotic stimuli, and associated hormonal interaction, for attenuation of thirst during immersion.

Derived from text

*Antidiuretics; Cardiovascular System; Human Beings; Hydration; Immunoassay; Peptides; Water Immersion*

20000064093 Georgetown Univ., Washington, DC USA

Advanced Medical Technology and Network Systems Research *Annual Report, 31 Aug. 1998 - 31 Aug. 1999*

Mun, Seong K.; Sep. 1999; 170p; In English

Contract(s)/Grant(s): DAMD17-94-V-4015

Report No.(s): AD-A376158; No Copyright; Avail: CASI; A02, Microfiche; A08, Hardcopy

The focus of the Medical Vanguard Project has continued to progress in the fields of telemedicine, surgical simulation, and distance education. The key areas that the annual report presents includes: The shift from interactive video based telemedicine to non-interactive, store and forward applications that are Internet based: This switch comes from the difficulties in scheduling interactive sessions with physicians who already have tight schedules and therefore make the telemedicine consult difficult. We have launched an extensive Internet telemedicine program in two chronic illness areas, diabetes and home peritoneal dialysis from the previous efforts dealing with telemedicine support for acute care. Also reported this year is the development of a global MRI teleradiology network to support medical research of rare diseases where studies from multiple institutions, including international sites. The support of distance medical education, a comprehensive database containing pathology slides of 240 prostate surgical specimens was established at the ISIS Center. Our simulated biopsy indicates that the current biopsy protocol is suboptimal. The integration of imaging systems and surgical procedures effort is accomplished in part by establishing the technology requirements for image-guided therapies. Advanced technologies included in this report are impedance imaging and a palpation training system.

DTIC

*Biotechnology; Telemedicine; Medical Science; Aerospace Medicine*

20000064713 NASA Ames Research Center, Moffett Field, CA USA

Hypervolemia from Drinking Hyperhydration Solutions at Rest and Exercise

Greenleaf, John E., NASA Ames Research Center, USA; Looft-Wilson, Robin, NASA Ames Research Center, USA; Jackson, Catherine G. R., University of Northern Colorado, USA; Geelen, Ghislaine, Lyon-1 Univ., France; Barnes, Paul R., San Francisco State Univ., USA; Jensen, Christopher D., Shaklee US, Inc., USA; Whittam, James H., Shaklee US, Inc., USA; Apr. 05, 1995, pp. 95-96; In English; Life Sciences and Space Medicine Conference, 3-5 Apr. 1995, Houston, TX, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The mechanism of muscular fatigue from physical work and exercise (high metabolism) is not clear, but involves disturbances of muscle surface membrane excitation-contraction coupling from changes in sarcoplasmic reticulum Ca<sup>2+</sup> release, cell H<sup>+</sup> and Pi responses, and carbohydrate metabolism. Fatigue in people at rest (low metabolism) involves both psychological and physiological factors, probably in different proportions. One common factor appears to be the level and distribution of water and electrolytes within muscle cells and other vascular, interstitial, body fluid compartments. The vascular fluid volume, composed of plasma and red blood cells, is a primary regulatory factor for cardiovascular function; reduction of vascular volume (hypovolemia) and total body water (hypohydration) adversely affect exercise performance. Plasma volume and plasma ionic-osmotic constituent concentrations are also regulatory factors for body thermoregulation, which is often compromised from exercise induced hypovolemia and hypohydration. Rehydration of dehydrated people on earth is relatively easy with appropriate food (osmols), fluid, and a restful environment. But ad libitum drinking under stressful conditions; e.g., heat, exercise, or prior dehydration, results in involuntary dehydration defined as the delay in full fluid replacement (euhydration) during and following loss of body fluid. Astronauts, with their reduced total body water are euhydrated while in weightlessness, but become "dehydrated" during reentry and landing. Thus, people subjected to acute or chronic stress are probably somewhat "dehydrated" as well as fatigued. Many rehydration drinks are more concentrated (hypertonic-hyperosmotic) with respect to the normal plasma osmolality of 285 mOsm/kg H<sub>2</sub>O and more of the drink osmols are contributed by carbohydrates than by ionized substances. There have been few studies on the efficacy of various drink formulations for increasing body fluid compartment volumes, especially plasma volume, in rested hydrated subjects. Recent findings from our laboratory have indicated that drinks containing greater concentrations of ionized substances (Performance 1 and AstroAde) up to 157 mEq/L Na<sup>+</sup> induced greater levels of hypervolemia

in resting, moderately dehydrated men, and were also better than water for attenuating the characteristic hypovolemia during supine, submaximal, leg ergometer exercise.

Author

*Drinking; Hydration; Hypervolemia; Physical Exercise; Solutions; Bed Rest; Aerospace Medicine*

~~20000064924~~ Institute for Human Factors TNO, Soesterberg, Netherlands

**Positive Pressure Breathing During Rest and Exercise** *Final Report Ademen met Overdruk Tijdens Rust en Inspanning*  
denHartog, E. A., Institute for Human Factors TNO, Netherlands; Heus, R., Institute for Human Factors TNO, Netherlands;  
vandeWater, G. J., Institute for Human Factors TNO, Netherlands; Aug. 20, 1999; 27p; In Danish

Contract(s)/Grant(s): B97-043; TNO Proj. 789.2

Report No.(s): TD-99-0334; TM-99-8010; Copyright; Avail: Issuing Activity

Using a positive pressure respirator a higher level of protection can be attained than with the current gasmask. An optimal positive pressure respirator produces a pressure just above atmospheric pressure during the whole breathing cycle under all circumstances. It is not known whether the commercially available respirator systems can maintain the positive pressure during heavy exercise. The high inspiratory peakflows (5 to 10 l/s) can cause short periods of negative pressure, which may significantly decrease the protection level. A possible solution might be to control the blower so that it can generate a higher (peak)flow during heavy exercise. From the literature it is found that during exercise there are some effects of positive pressure breathing on ventilation and blood circulation. In this study we investigated whether it was possible to maintain a positive pressure during heavy exercise with a blower that may be used integrated in a portable system. Furthermore, the physiological effects and feelings of discomfort were investigated during exercise while breathing under positive pressure. Eight subjects participated in this study. They used the respirator system (blower and gasmask@ during rest and heavy exercise on the bicycle ergometer. During exercise the subject cycled at 80% of their individual maximum. The experiments were performed at different levels of the blower (low and high flow) and at different pressures (0 to 10 mbar). The different pressure levels were set by changing the expiratory resistance. An extra set of conditions was created by using the pressure under the gasmask as a feedback signal for the blower. This caused the air flow from the blower to increase as the pressure decreased. Without the blower the pressure became negative during 50% (SD 4%) of the breathing cycle. With the blower the negative pressure averaged for 15% (SD 10% of the breathing cycle. With the highest setting of the blower the pressure still became negative for 5% (SD 10%) of the breathing cycle. We found no significant effects on ventilation or blood pressure caused by the increased breathing pressure. We did find an increase in oxygen consumption compared to the situation without gasmask and blower. This means that breathing through a respirator system with gasmask and blower requires more effort than normal breathing. The feedback of the pressure to the blower produces a decrease in power requirements. Besides, there was a trend that it caused less discomfort, probably caused by the decrease in pressure difference between inspiration and expiration. However, due to the large variance in the data we found no significant differences between most conditions. From the results it was deduced that the currently available commercial blower systems do not supply a sufficient air flow to maintain a positive pressure during heavy exercise. This decreases the advantage of the positive pressure respirator system. to maintain the positive pressure during heavy exercise a more powerful blower is required, which can generate a larger air flow at higher pressures. However, physiological effects on ventilation and blood circulation can be expected, if such systems are used.

Author

*Atmospheric Pressure; Blood Circulation; Expiration; Oxygen Consumption; Physiological Effects; Pressure Breathing; Pressure Effects; Respirators*

~~20000065651~~ NASA Johnson Space Center, Houston, TX USA

**The Physiology of Bed Rest, Chapter 39**

Fortney, Suzanne M., NASA Johnson Space Center, USA; Schneider, Victor S., NASA Johnson Space Center, USA; Greenleaf, John E., NASA Ames Research Center, USA; Handbook of Physiology. Section 4: Environmental Physiology. 3: The Gravitational Environment; 1996; Volume 2, Chapter 39, pp. 889-939; In English

Contract(s)/Grant(s): NIH-RR-00350; NIH-RR-02558; RTOP 199-18-12-07; RTOP 199-26-11-01; RTOP 199-14-11-13; Copyright; Avail: Issuing Activity

Prolonged rest in bed has been utilized by physicians and other health-care workers to immobilize and confine patients for rehabilitation and restoration of health since time immemorial. The sitting or horizontal position is sought by the body to relieve the strain of the upright or vertical postures, for example during syncopal situations, bone fractures, muscle injuries, fatigue, and probably also to reduce energy expenditure. Most health-care personnel are aware that adaptive responses occurring during bed rest proceed concomitantly with the healing process; signs and symptoms associated with the former should be differentiated from those of the latter. Not all illnesses and infirmities benefit from prolonged bed rest. Considerations in prescribing bed rest for

patients-including duration, body position, mode and duration of exercise, light-dark cycles, temperature, and humidity-have not been investigated adequately. More recently, adaptive physiological responses have been measured in normal, healthy subjects in the horizontal or slightly head-down postures during prolonged bed rest as analogs for the adaptive responses of astronauts exposed to the microgravity environment of outer and bed-rest research.

Derived from text

*Astronauts; Bed Rest; Bones; Health; Microgravity; Muscles; Physical Exercise; Signs and Symptoms*

20000066613 Institute for Human Factors TNO, Soesterberg, Netherlands

**Revision of Visual Standards for the Netherlands Royal Navy: Binocular Depth Perception Reconsidered** *Interim Report Herziening Visuele Keuringseisen voor de Koninklijke Marine; Eisen voor het Binoculair Diepteziën*

Walraven, J., Institute for Human Factors TNO, Netherlands; Kooi, F. L., Institute for Human Factors TNO, Netherlands; Sep. 22, 1999; 30p; In Dutch

Contract(s)/Grant(s): A98/KM/306; TNO Proj. 786.2

Report No.(s): TD-99-0340; TM-99-A062; Copyright; Avail: Issuing Activity

In the context of the revision of the visual standards for the Netherlands Royal Navy, this study addresses the need for a pass/fail score for binocular depth perception. On the basis of a literature search and our own expertise we conclude that the potential advantages of binocular depth perception are not essential for the visual aspects of an adequate functional performance within the services of the Netherlands Royal Navy. An exception is made for operators of stereoscopic measuring equipment. One of the main considerations underlying the above conclusion was, that the monocular cues for depth perception are so effective that there is no need for the additional information provided by binocular parallax. This is also consistent with the results of various accident analyses studies, showing that the lack of binocular depth perception cannot be linked to an enhanced risk in road and flight accidents. Also experiments in which binocular and monocular performance is compared of drivers maneuvering through a slalom circuit, or the performance of pilots landing their planes, indicate that binocular depth perception is not essential for these tasks. The present pass/fail score presently used by the Netherlands Royal Navy (i.e. 400" on the TNO stereo test) already implies, in effect, that depth perception should not be taken too seriously. A score of 400" attests to a very low level of stereoscopic acuity, which means for example, that the difference in distance between 10 m and 14 m cannot be discriminated on the basis of the binocular parallax cue. Therefore, a further lowering of the pass/fail criterion, or even abandoning it altogether, should not be considered as an enhanced risk due to inadequate functional performance. Although the depth perception score may be relinquished as a selection criterion, we nevertheless recommend that candidates take the test for diagnostic purposes. The test score still provides additional information about the status of the visual system, in particular with respect to eye coordination. This may also become relevant when it comes to the employment of the Helmet Mounted Display (HMD), as is to be anticipated in the context of the future Soldier Modernization Program (SMP).

Author

*Binocular Vision; Criteria; Space Perception; Stereoscopic Vision; Visual Acuity; Acceptability; Human Performance*

20000066624 Air Force Inst. of Tech., School of Engineering, Wright-Patterson AFB, OH USA

**A Pharmacokinetic Study of the Effects of Stress on Chemical Exposure**

Suhajda, Sierra H.; Mar. 2000; 145p; In English

Report No.(s): AD-A377269; AFIT/GEE/ENV/00M-16; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Following the Gulf War there were many concerns raised about human exposure to the combination of chemicals and stress. Stress causes several changes in basic functions of a human body, from breathing and blood flow changes to hormonal and enzyme changes, and increased permeability of the blood-brain barrier. Each of these changes can strongly influence chemical uptake, distribution, and accumulation in the body. The purpose of this thesis was to model and predict the changes that will occur when stress is combined with chemical exposure. Physiologically-based pharmacokinetic (PBPK) modeling is one tool that can be used to visualize, predict, and generate a hypothesis about chemical exposures. A PBPK model was developed that simulated human tissue compartments during chemical exposure and different levels of exercise. The PBPK model developed is a valid tool for helping explain and predict the fate and transport of a chemical on an individual under stress. The results suggest that the brain compartment is of high importance when addressing the uptake of chemicals during exercise. The maximal uptake of a chemical from the blood-brain barrier, as well as the decreased enzymatic levels in the brain compartment have been identified as key parameters for further study.

DTIC

*Chemical Reactions; Stress (Physiology); Blood Flow; Pharmacology*

20000068437 Aeromedical Inst., Soesterberg, Netherlands

**Sleep and Alertness Management During Military Operations: Review and Plan of Action *Final Report***

Simons, M., Aeromedical Inst., Netherlands; November 1999; 47p; In English

Contract(s)/Grant(s): A99/M/101

Report No.(s): Rept-1999-K5; Rept-2000-0002; Copyright; Avail: Issuing Activity

Sleep and alertness management is a major point of attention for commanders and the medical support of military round the clock operations. Awareness on the effects of fatigue and sleepiness should be enhanced both on command level and crew level. Flight surgeons and safety officers should be trained to develop and implement mission specific crew endurance plans. Practical guidelines on methods to prevent serious fatigue and to enhance performance and alertness of the crew play a key role in these crew endurance plans. Useful methods include the use of strategic naps, hypnotics, stimulants, and chronobiotic treatment. In the context of the development of guidelines to optimize performance and alertness during sustained and stressful missions, this literature review describes the available knowledge and identifies areas where knowledge is lacking. In this context military relevant research issues related to the use of strategic naps, hypnotics, stimulants, and chronobiotic treatment are put forward. Based on the results of this study, a work program is drawn up, aimed at developing guidelines to optimize performance and alertness during sustained intensive operations.

Author

*Sleep; Alertness; Military Operations; Clocks; Fatigue (Biology)*

20000068935 Civil Aeromedical Inst., Oklahoma City, OK USA

**Prevalence of Drugs and Alcohol in Fatal Civil Aviation Accidents Between 1994 and 1998 *Final Report***

Canfield, Dennis V., Civil Aeromedical Inst., USA; Hordinsky, Jerry, Civil Aeromedical Inst., USA; Millett, David P., Federal Aviation Administration, USA; Endecott, Boyd, Civil Aeromedical Inst., USA; Smith, Dudley, Civil Aeromedical Inst., USA; June 2000; 12p; In English

Contract(s)/Grant(s): AM-B-98-TOX-202

Report No.(s): DOT/FAA/AM-00/21; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The use of drugs and alcohol in aviation is closely monitored by the FAA Office of Aviation Medicine's (OAM's) Civil Aeromedical Institute (CAMI) through the toxicological analysis of specimens from pilots who have died in aviation accidents. This information on the use of drugs in aviation is helpful to the FAA in developing programs to reduce the usage of dangerous drugs and identify potentially incapacitating medical conditions that may cause an accident. Data collected from this research can be used to evaluate the effectiveness of the FAA drug testing program. The toxicology reports prepared by the CAMI Forensic Toxicology Research Section are used by the FAA and the National Transportation Safety Board to determine the cause of aviation accidents. Specimens (blood, urine, liver, kidney, vitreous fluid, and other bodily specimens) were collected by pathologists near the accident and placed in evidence containers provided by CAMI. These samples were refrigerated and shipped by overnight air. Upon receipt, the specimens were inventoried and accessioned for the analysis of drugs, alcohol, carbon monoxide, and cyanide. All data collected by the laboratory were entered into a computer database for future analysis. The database was searched using a Microsoft Access TM program developed by a local contractor. The database was sorted based on the class of drug, controlled dangerous substance schedules I and II, controlled dangerous substance schedules III-V, prescription drugs, over-the-counter drugs, and alcohol. The Toxicology and Accident Research Laboratory received specimens from 1683 pilots for postmortem toxicology analysis between 1994 to 1998. Controlled dangerous substances, CDS, (schedules I and II) were found in 89 of the pilots analyzed. Controlled dangerous substances (schedules III - V) were found in 49 of the pilots tested. Prescription drugs were found in 240 of the pilots analyzed. Over-the-counter drugs were found in 301 of the pilots analyzed. Alcohol at or above the legal limit of 0.04% was found in 124 pilots. The number of positive drug cases has doubled over the past 5 years. Over-the-counter medications are the most frequently found drugs in fatal aviation accidents and many of these drugs, or the medical conditions for which they are being used, could impair a pilot's ability to safely fly an aircraft. The increased number of positive cases found in this research is most likely the result of improved methods of analysis, rather than an increase in the use of drugs. The low incidence of CDS III-V drugs found in fatal aviation accidents may be a result of the difficulty in finding and identifying the new benzodiazepines commonly prescribed in this class.

Author

*Aircraft Accidents; Alcohols; Civil Aviation; Drugs; Death; Aerospace Medicine; Aircraft Pilots*

20000069644 NASA Ames Research Center, Moffett Field, CA USA

**Beta-Adrenergic Blockade Does not Prevent Polycythemia or Decrease in Plasma Volume in Men at 4300 m Altitude**

Grover, R. F., Colorado Univ., USA; Selland, M. A., Colorado Univ., USA; McCullough, R. G., Colorado Univ., USA; Dahms, T. E., Saint Louis Univ. School of Medicine, USA; Wolfel, E. E., Colorado Univ., USA; Butterfield, G. E., Palo Alto Veterans

Administration Health Care System, USA; Reeves, J. T., Colorado Univ., USA; Greenleaf, J. E., NASA Ames Research Center, USA; European Journal of Applied Physiology; 1998; Volume 77, pp. 264-270; In English  
Contract(s)/Grant(s): DAMD17-91-C-1112; NIH-HL-14984; NIH-HL-46481; RTOP 199-18-12-07; Copyright; Avail: Issuing Activity

When humans ascend to high altitude (ALT) their plasma volume (PV) and total blood volume (BV) decrease during the first few days. With continued residence over several weeks, the hypoxia-induced stimulation of erythropoietin increases red cell production which tends to restore BV. Because hypoxia also activates the beta-adrenergic system, which stimulates red blood cell production, we investigated the effect of adrenergic beta-receptor inhibition with propranolol on fluid volumes and the polycythemic response in 11 healthy unacclimatized men (21-33 years old exposed to an ALT of 4300 m (barometric pressure 460 Torr) for 3 weeks on Pikes Peak, Colorado. PV was determined by the Evans blue dye method (PV(sub EB)), BV by the carbon monoxide method (BV(sub CO)), red cell volume (RCV) was calculated from hematocrit (Hct) and BV(sub CO), and serum erythropoietin concentration ([EPO]) and reticulocyte count, were also determined. All determinations were made at sea level and after 9-11 (ALT-10) and 9-20 (ALT-20) days at ALT. At sea level and ALT, six men received propranolol (pro, 240 mg/day), and five received a placebo (pla). Effective beta-blockade did not modify the mean (SE) maximal values of [EPO] [pla: 24.9 (3.5) vs pro: 24.5 (1.5) mU/ml] or reticulocyte count [pla: 2.7 (0.7) vs pro: 2.2 (0.5)%]; nor changes in PV(sub EB) [pla: -15.8 (3.8) vs pro: -19.9 (2.8)%], RCV(sub CO) [pla: +7.0 (6.7) vs pro: +10.1 (6.1)%], or BV(sub CO) [pla: -7.3 (2.3) vs pro: -7.1 (3.9)%]. In the absence of weight loss, a redistribution of body water with no net loss is implied. Hence, activation of the beta-adrenergic system did not appear to affect the hypovolemic or polycythemic responses that occurred during 3 weeks at 4300 m ALT in these subjects.

Author

*Adrenergics; Antiadrenergics; Blood Volume; Hematopoietic System; Hematocrit; Erythrocytes; Hypovolemia; Polycythemia; Reticulocytes*

20000069799 NASA Ames Research Center, Moffett Field, CA USA

#### **Exercise Thermoregulation After 6 hours of Chair Rest, 6 deg Head-Down Bed-Rest, and Water Immersion Deconditioning in Men**

Greenleaf, J. E., NASA Ames Research Center, USA; Hutchinson, T., NASA Ames Research Center, USA; Shaffer-Bailey, M., NASA Ames Research Center, USA; Looft-Wilson, R., NASA Ames Research Center, USA; Eur Journal of Applied Physiology; 1996; Volume 72, pp. 303-309; In English

Contract(s)/Grant(s): RTOP 199-18-12-07; Copyright; Avail: Issuing Activity

The purpose was to investigate the mechanism for the excessive exercise hyperthermia following deconditioning (reduction of physical fitness). Rectal ( $T_{\text{sub re}}$ ) and mean skin ( $T_{\text{bar(sub sk)}}$ ) temperatures and thermoregulatory responses were measured in six men [mean (SD) age, 32 (6) years; mass, 78.26 (5.80) kg; surface area, 1.95 (0.11) sq m; maximum oxygen uptake ( $\text{VO}_{2\text{max}}$ ), 48 (6) ml/min/kg; whilst supine in air at dry bulb temperature 23.2 (0.6)°C, relative humidity 31.1 (11.1)% and air speed 5.6 (0.1) m/min] during 70 min of leg cycle exercise [51 (4)%  $\text{VO}_{2\text{max}}$ ] in ambulatory control (AC), or following 6 h of chair rest (CR), 6deg head-down bed rest (BR), and 20deg (W120) and 80deg (W180) foot-down water immersion [water temperature, 35.0 (0.1) °C]. Compared with the AC exercise ( $\Delta T_{\text{sub re}}$ ) [mean (SD) 0.77 (0.13)°C], ( $\Delta T_{\text{sub re}}$ ), after CR was 0.83 (0.08)°C (NS), after BR 0.92 (0.13)°C (\*P is less than 0.05), after W180 0.96 (0.13)°C\*, and after W120 1.03 (0.09)°C\*. All  $T_{\text{sub sk}}$  responded similarly to exercise: they decreased (NS) by 0.5-0.7 °C in minutes 4-8 and equilibrated at +0.1 to +0.5 °C at 60-70. Skin heat conductance was not different among the five conditions (range = 147-159 kJ/sq/°C. Results from an intercorrelation matrix suggested that total body sweat rate was more closely related to  $T_{\text{sub re}}$  at 70 min ( $T_{\text{sub re70}}$ ) than limb sweat rate or blood flow. Only 36% of the variability in  $T_{\text{sub re70}}$  could be accounted for by total sweating, and less than 10% from total body dehydration. It would appear that multiple factors are involved which may include change in sensitivity of thermo- and osmoreceptors.

Author

*Physical Exercise; Thermoregulation; Deconditioning; Water Immersion; Bed Rest; Hyperthermia; Males*

20000070333 Army Research Inst. of Environmental Medicine, Military Performance Div., Natick, MA USA

#### **The Effects of backpack weight on the biomechanics of load carriage**

Harman, Everett; Hoon, Ki; Frykman, Peter; Pandorf, Clay; May 03, 2000; 72p; In English

Report No.(s): AD-A377886; USARIEM-T00-17; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

An analysis of the effects of 4 backpack loads (6, 20, 33, and 44 kg) on walking gait was performed on 16 male volunteers using a cinematographic system, force platform, tri-axial accelerometer, and 6 surface electrodes located over the trapezius, spinal erector, quadriceps, hamstring, gastrocnemius and tibialis anterior muscles. When the load became very heavy, stride frequency increased. Double-support as percent of stride increased along with the load, effected by a delayed floor push-off. Knee range of

motion increased with load during the eccentric knee flexion period from heel-strike until mid-stance. A lower total body center of mass position as the load increased was effected both by greater knee flexion and a more forward leaning trunk. An initial propulsive impulse at heel-strike resulted from flexion at the knee rather than from extension at the hip. A protective gait adjustment when increasing to the heaviest load limited the medial travel of the center of mass. As the load increased, hip extensor torque increased proportionately. Yet knee extensor torque increased more than expected, while ankle plantarflexor torque increased less than expected. Trapezius muscle activity showed that the frame-and-belt system did not prevent the shoulders from supporting considerable load. The spinal erectors produced the largest burst of activity at contralateral heel-strike. The gastrocnemius was largely inactive except for high activity during push-off, which did not increase with very heavy loads. The burden of carrying a very heavy load fell less on the calf muscles than on the muscles around the knee and hip. Trunk forward/downward excursion and acceleration increased with load. The erector spinae acted eccentrically to decelerate trunk motion as the trunk approached its maximum forward lean. Slack in the straps enabled peak forward acceleration of the pack to occur later and be of lower magnitude than the peak forward acceleration of the trunk.

DTIC

*Physiological Effects; Activity (Biology); Biodynamics; Muscular Function*

20000070427 National Defence Research Establishment, Div. of Human Sciences, Linköping, Sweden

Testing Models for Estimating Physical Working Capacity *Proevning av Skattningsmodeller foer Arbetsprovet*

Wenemark, R.; Aven, A.; Sep. 1998; 24p; In Swedish

Report No.(s): PB2000-103097; FOA-R-98-00855-720-SE; No Copyright; Avail: National Technical Information Service (NTIS)

This document describes two models (Model 1 and 2) for estimating physical working capacity. The purpose of using a model is that draftees can be estimated even though they can not accomplish the physical working capacity test. by using a model the estimation of a draftee will also be equal all over the country. The two models are based on the draftees weight and estimation of their condition compared to their classmates. Those two variables create the two suggested models. The models use different criteria of the variables when estimating the draftees.

NTIS

*Performance Tests; Work Capacity; Muscular Strength*

20000070502 NASA Ames Research Center, Moffett Field, CA USA

Leucocytosis, Thrombocytosis, and Plasma Osmolality During Rest and Exercise: A Hypothesis

McKenzie, M. A., San Francisco State Univ., USA; Greenleaf, John E., NASA Ames Research Center, USA; Looft-Wilson, R., NASA Ames Research Center, USA; Barnes, P. R., San Francisco State Univ., USA; Journal of Physiology and Pharmacology; 1999; Volume 50, No. 2, pp. 259-273; In English; Sponsored in part by Shaklee Technica

Contract(s)/Grant(s): NGT-50686; NAG8-227; JSRA-7; RTOP 199-18-07; Copyright; Avail: Issuing Activity

The mechanism for inducing leucocytosis (increase in white blood cells) and thrombocytosis (increase in platelets) during exercise is unclear. Because plasma osmolality (Osm) may influence T-cell proliferation, Osm and the number of leucocytes (WBC) and platelets in blood were measured periodically during a 90 min rest period, and were compared with those during upright sitting ergometer exercise in six untrained, healthy men who cycled for 70 min at 71% of their maximal oxygen uptake ( $V_{O_{2max}}$ ). There were 6 experiments in which the subjects drank different fluid formula-tions (10 ml/kg) of various ionic and osmotic concentrations intermittently during 60 min of the rest period and during the exercise period. Osmolality, and WBC and platelet counts increased significantly ( $p < 0.05$ ) within the first 10 min of exercise, but the additional 60 min of exercise did not significantly change the leucocytosis or thrombocytosis. There were low but significant correlations between individual values of total WBC and total Osm during exercise ( $r_{(0.001(2),284)} = 0.39$ ) and during rest plus exercise ( $r_{(0.001(2),499)} = 0.43$ ). With combined data from the six experiments, mean Osm correlated highly and significantly with both mean WBC ( $r_{(0.001(2),6)} = 0.95$ ,  $p < 0.001$ ) and mean platelets ( $r_{(0.001(2),6)} = 0.94$ ,  $p < 0.01$ ) during the exercise phase. These data indicate that increases in leucocytes, thrombocytes, and osmolality occur primarily within the first 10 min of high-intensity exercise, but neither hypovolemia nor hyperthermia during exercise contributed to the leucocytosis, thrombocytosis, or hyperosmolality. The high correlations between plasma Osm and WBC or platelet counts suggest changes in osmolality may contribute to the mechanism of leucocytosis and thrombocytosis induced by exercise.

Author

*Leukocytes; Thrombocytes; Platelets; Plasmas (Physics); Osmosis; Cell Membranes (Biology); Regeneration (Physiology)*

*Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.*

20000061164 Institute for Human Factors TNO, Soesterberg, Netherlands

*Concepts for Scenario-Based Training in Military Command Interim Report Concepten voor Scenario-Gebaseerde Training in Militaire Commandovoering*

vandenBosch, K., Institute for Human Factors TNO, Netherlands; Helsdingen, A. S., Institute for Human Factors TNO, Netherlands; Apr. 10, 2000; 50p; In Dutch

Contract(s)/Grant(s): B98-054; TNO Proj. 790.3

Report No.(s): TD-2000-0135; TM-00-8006; Copyright; Avail: Issuing Activity

Problem: Military personnel are, particularly in peacekeeping and peace-enforcing operations, confronted with unfamiliar and uncertain situations. Decisions have to be made under time-pressure that can have severe military and/or political implications. Successful performance in environments characterised by complex and unstable political and military conditions requires adequate training in tactical command. Scenario-based training offers the opportunity to acquire task critical skills under controlled conditions, and to systematically acquire experience in applying these skills in a symbolic and simplified task environment. In the context of increasing use of synthetic training environments (C2-trainers), it is necessary to examine how Dutch military training centres specify scenarios for training, and to investigate recent scientific developments on methods for scenario specification. Activities: Studying the psychological and military literature on methods for the development of scenarios for training tactical command skills, and a field survey into procedures for developing scenarios in tactical command training within Dutch military training institutions. Results: Effective training requires practice scenarios that supports skill learning as well as the utilisation of skill under complex operational conditions. Various researchers and organisations have developed guidelines supporting the specification of adequate training scenarios. An important function of scenario based training is the acquisition of domain knowledge. Scenarios must be designed in such a way that trainees can expand their knowledge database with relevant situation and events. to determine which situations are relevant and which are not can be inferred from mission and task analyses, but also from analysing expert behaviour (through observation, verbal protocols, and interviews). Expert behaviour should not be the only input for developing training scenarios, because experts often fail to critically evaluate their implicit assumptions and expectations when they assess a situation. Good training therefore includes scenarios that violate prevalent expectations, so that trainees learn to critically evaluate their expectations and learn to develop contingency plans for if the situation develops differently than expected. A second important function of scenario based training is to provide trainees with the opportunity to acquire and practise the expert approach. However, determining whether or not trainees have succeeded is a problem. Processes like reasoning, memory retrieval, knowledge integration can not be inferred unambiguously from observable task behaviour. Making inferences about the internal processes based upon minor actions, or no actions, requires ample domain knowledge and a thorough appreciation of preceding, current, and anticipated events. Subject Matter Experts are needed to make the higher order transformations needed to evaluate the appropriateness of trainee behaviour. However, there is evidence that subject matter experts are unable to specify the criteria they use for performance assessment. The reviewed guidelines for developing training scenarios are often fairly general, and sometimes even obligatory.

Author

*Education; Data Bases; Protocol (Computers); Training Devices*

20000062463 California Univ., San Diego, Dept. of Family and Preventative Medicine, La Jolla, CA USA

*The Evolution of Networks in Extreme and Isolated Environment Final Report*

Johnson, Jeffrey C., East Carolina Univ., USA; Boster, James S., Connecticut Univ., USA; Palinkas, Lawrence A., California Univ., San Diego, USA; [2000]; 42p; In English

Contract(s)/Grant(s): NAG5-4571; NSF BNS-90-11351; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This article reports on the evolution of network structure as it relates to the formal and informal aspects of social roles in well bounded, isolated groups. Research was conducted at the Amundsen-Scott South Pole Station over a 3-year period. Data was collected on crewmembers' networks of social interaction and personal advice over each of the 8.5-month winters during a time of complete isolation. In addition, data was collected on informal social role structure (e.g., instrumental leadership, expressive leadership). It was hypothesized that development and maintenance of a cohesive group structure was related to the presence of and group consensus on various informal social roles. The study found that core-periphery structures (i.e., reflecting cohesion) in winter-over groups were associated with the presence of critically important informal social roles (e.g., expressive leadership) and high group consensus on such informal roles. On the other hand, the evolution of clique structures (i.e., lack of cohesion) were

associated with the absence of critical roles and a lack of consensus on these roles, particularly the critically important role of instrumental leader.

Author

*Networks; Evolution (Development); Isolation; Environments; Range (Extremes)*

20000064711 Massachusetts Inst. of Tech., Dept. of Aeronautics and Astronautics, Cambridge, MA USA

*Situational Awareness Issues in the Implementation of Datalink: Shared Situational Awareness in the Joint Flight Deck-ATC Aviation System Final Report, 1 Jan. 1991 - 30 Sep. 1999*

Hansman, Robert John, Jr., Massachusetts Inst. of Tech., USA; [1999]; 7p; In English

Contract(s)/Grant(s): NAG2-716; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

MIT has investigated Situational Awareness issues relating to the implementation of Datalink in the Air Traffic Control environment for a number of years under this grant activity. This work has investigated: 1) The Effect of "Party Line" Information. 2) The Effect of Datalink-Enabled Automated Flight Management Systems (FMS) on Flight Crew Situational Awareness. 3) The Effect of Cockpit Display of Traffic Information (CDTI) on Situational Awareness During Close Parallel Approaches. 4) Analysis of Flight Path Management Functions in Current and Future ATM Environments. 5) Human Performance Models in Advanced ATC Automation: Flight Crew and Air Traffic Controllers. 6) CDTI of Datalink-Based Intent Information in Advanced ATC Environments. 7) Shared Situational Awareness between the Flight Deck and ATC in Datalink-Enabled Environments. 8) Analysis of Pilot and Controller Shared SA Requirements & Issues. 9) Development of Robust Scenario Generation and Distributed Simulation Techniques for Flight Deck ATC Simulation. 10) Methods of Testing Situation Awareness Using Testable Response Techniques. The work is detailed in specific technical reports that are listed in the following bibliography, and are attached as an appendix to the master final technical report.

Derived from text

*Air Traffic Control; Data Links; Avionics; Human Factors Engineering*

20000064923 NASA Johnson Space Center, Houston, TX USA

*Preparing for Long Duration Space Missions: Discussion and Resource Guide for Astronauts*

Galarza, Laura, Wyle Labs., Inc., USA; Holland, Albert, NASA Johnson Space Center, USA; Hysong, Sylvia J., Rice Univ., USA; Lugg, Desmond J., Australian Antarctic Div., Australia; Palinkas, Lawrence A., California Univ., USA; Stuster, Jack, Anacapa Sciences, Inc., USA; Witham, Lynn, Witham and Associates, USA; Wood, JoAnna, National Space Biomedical Research Inst., USA; Nov. 30, 1999; 18p; In English

Contract(s)/Grant(s): NAG5-4571; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This guide was developed in support of the Flight Crew Operations Directorate's Long Duration Expedition Training Workshops. Contents include the following: effective team behavior; the role of team members; dimensions of group effectiveness; factors affecting team performance (selected examples); and general subthemes for teamwork and group living.

Derived from text

*Education; Flight Crews; Human Performance; Teams*

20000066602 Institute for Human Factors TNO, Soesterberg, Netherlands

*Uni and Cross Modal Tracking of Visual and Vibro-Tactile Stimuli Interim Report Uni-en Kruismodaal Volgen van Visuele en Vibrotactiele Stimuli*

vanErp, J. B. F., Institute for Human Factors TNO, Netherlands; Feb. 16, 2000; 33p; In English

Contract(s)/Grant(s): B99-031; TNO Proj. 788.1

Report No.(s): TD-2000-0113; TM-00-B002; Copyright; Avail: Issuing Activity

Contemporary tactile display technology presents the observer with dynamic tactile stimuli. The present study investigates performance in pursuit and compensatory tracking tasks with tactile and/or visual presentation of target and cursor. Normally, the tactile modality is not extensively used as information channel in man-machine interfaces. The current investigation tries to cover two deficiencies in the literature: knowledge on pursuit tracking performance with tactile displays, and the use of error coding that is natural and equivalent to visual displays. The results show that tracking errors are 2.5 times higher with the tactile display than with the visual display. The largest problems seem to arise when external disturbances are presented to the tactile modality. Especially noteworthy is the increased tracking delay in these situations. Adding additional sensory information (e.g., feedback of the motor system with manual control) can improve the perception of dynamic tactile stimuli. Moreover, the tactile modality is suitable to present target or set-point information in compensatory tracking tasks, and as cursor in pursuit tracking tasks. The results of the cross-modal tasks on the tracking error fit well to an 'additional model', the tracking delay can be described by a

serial model. The latter model gives a slight overestimation, which may be due to the cross-modal advantage of the absence of an attentional blink.

Author

*Display Devices; Pursuit Tracking; Electrocutaneous Communication; Sensory Perception; Tactile Discrimination; Mechanoreceptors*

20000067670 California Univ., San Diego, Dept. of Family and Preventative Medicine, La Jolla, CA USA

**Summary of Research Issues in Behavior and Performance in Isolated and Confined Extreme (ICE) Environments**

Palinkas, Lawrence A., California Univ., San Diego, USA; [2000]; 8p; In English

Contract(s)/Grant(s): NAG5-4571; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The papers presented in this section describe changes in behavior and performance in various isolated and confined extreme (ICE) environments, including Antarctic expeditions and research stations, space simulators and isolation chambers, and submarines. Each of these environments possesses characteristics that are in some way analogous to those found on long-duration space missions. Despite differences in length of mission, characteristics of mission personnel or crew, and characteristics in the physical environment, the various ICE environments described in this collection of papers appear to produce similar changes in behavior and performance. These changes include increased disturbances of mood, increased rates of psychiatric disorder, increased interpersonal tension, and a disruption of circadian rhythms. However, these environments do not inherently produce decrements in performance. Palinkas and colleagues suggest that prolonged exposure to the isolation and confinement in the Antarctic can actually have positive or "salutogenic" effects as well, evidenced by a decrease in mood disturbances and increase in performance measures.

Derived from text

*Antarctic Regions; Confinement; Controlled Atmospheres; Human Factors Engineering; Human Behavior; Human Performance*

20000068454 NASA Johnson Space Center, Houston, TX USA

**Antarctic Space Analog Program Final Report, 1 Jul. 1997 - 31 Dec. 1998**

Palinkas, Lawrence A., California Univ., San Diego, USA; Gunderson, E. K. Eric, Naval Health Research Center, USA; Johnson, Jeffrey C., East Carolina Univ., USA; Holland, Albert W., NASA Johnson Space Center, USA; [1998]; 8p; In English

Contract(s)/Grant(s): NAG5-4571; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The primary aim of this project was to examine group dynamics and individual performance in extreme, isolated environments and identify human factors requirements for long-duration space missions using data collected in an analog environment. Specifically, we wished to determine: 1) the characteristics of social relations in small groups of individuals living and working together in extreme, isolated environments, and 2) the environmental, social and psychological determinants of performance effectiveness in such groups. These two issues were examined in six interrelated studies using data collected in small, isolated research stations in Antarctica from 1963 to the present. Results from these six studies indicated that behavior and performance on long-duration space flights is likely to be seasonal or cyclical, situational, social, and salutogenic in nature. The project responded to two NASA program emphases for FY 1997 as described in the NRA: 1) the primary emphasis of the Behavior and Performance Program on determining long-term individual and group performance responses to space, identifying critical factors affecting those responses and understanding underlying mechanisms involved in behavior and performance, and developing and using ground-based models and analogs for studying space-related behavior and performance; and 2) the emphasis of the Data Analysis Program on extended data analysis. Results from the study were used to develop recommendations for the design and development of pre-flight crew training and in-flight psychological countermeasures for long-duration manned space missions.

Author

*Group Dynamics; Long Duration Space Flight; Sociology; Human Relations; Space Psychology; Social Factors; Space Flight Stress*

20000068515 NASA Johnson Space Center, Houston, TX USA

**Behavior and Performance on Long-Duration Spaceflights: Evidence from Analogue Environments**

Palinkas, Lawrence A., California Univ., USA; Gunderson, E. K. Eric, Naval Health Research Center, USA; Johnson, Jeffrey C., East Carolina Univ., USA; Holland, Albert W., NASA Johnson Space Center, USA; [1999]; 28p; In English

Contract(s)/Grant(s): NAG5-4571; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Analyses of data collected in Antarctica since 1963 were conducted to identify features of behavior and performance likely to occur during long-duration missions in space. The influence of mission duration and station latitude on POMS mood scores was examined in 450 American men and women who overwintered in Antarctica between 1991 and 1998. The influence of

crewmember social characteristics, personality traits, interpersonal needs, and station environments on measures of behavior and performance at the end of the austral winter was examined in 657 American men who overwintered between 1963 and 1974. Both data sets were used to examine the influence of crew social structure on individual performance. Results: Seasonal variations in mood appear to be associated with the altered diurnal cycle and psychological segmentation of the mission. Concurrent measures of personality, interpersonal needs, and coping styles are better predictors of depressed mood and peer-supervisor performance evaluations than baseline measures because of the unique features of the station social and physical environments and the absence of resources typically used to cope with stress elsewhere. Individuals in crews with a clique structure report significantly more depression, anxiety, anger, fatigue and confusion than individuals in crews with a core-periphery structure. Depressed mood is inversely associated with severity of station physical environment, supporting the existence of a positive or "salutogenic" effect for individuals seeking challenging experiences in extreme environments.

Author

*Antarctic Regions; Human Beings; Predictions; Personality; Moods*

20000068932 California Univ., San Diego, Dept. of Family and Preventive Medicine, La Jolla, CA USA

**Sleep and Mood During A Winter in Antarctica**

Palinkas, Lawrence A., California Univ., San Diego, USA; Houseal, Matt, Texas Technological Univ., USA; Miller, Christopher, California Univ., San Diego, USA; International Journal of Circumpolar Health; [2000], pp. 63-73; In English

Contract(s)/Grant(s): NAG5-4571; NSF DDP-90-96178; Copyright; Avail: Issuing Activity

Seasonal variations in sleep characteristics and their association with changes in mood were examined in 91 American men and women also who spent the 1991 austral winter at three different research stations in Antarctica. Measures of total hours of sleep over a 24-hr period, duration of longest (i.e., "nighttime") sleep event, number of sleep events, time of sleep onset, and quality of sleep remained unchanged over the course of the austral winter (March through October). However, exposure to total darkness based on station latitude was significantly associated with total hours of sleep, duration of are longest sleep event, time of sleep onset, and quality of sleep. Reported vigor the previous month was a significant independent predictor of changes in all five sleep measures; previous month's measures of all six POMS subscales were significant independent predictors of sleep quality. Sleep characteristics were significant independent predictors of vigor and confusion the following month; total sleep, longest sleep event, sleep onset and sleep quality were significant independent predictors of tension-anxiety and depression. Changes in mood during the austral winter are preceded by changes in sleep characteristics, but prolonged exposure to the photoperiodicity characteristic of the high latitudes appears to be associated with improved sleep. In turn, mood changes appear to affect certain sleep characteristics, especially sleep quality.

Author

*Antarctic Regions; Human Beings; Moods; Sleep; Psychological Effects; Physiological Responses*

## 54

### MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

*Includes human factors engineering; bionics, man-machine, life support, space suits and protective clothing. For related information see also 16 Space Transportation and 52 Aerospace Medicine..*

20000061487 Air Force Research Lab., Human Effectiveness Directorate, Wright-Patterson AFB, OH USA

**Helmet Impact Tests with a Modified ACES 2 Headrest Interim Report, Nov 1998 - May 1999**

Perry, Chris E.; May 1999; 32p; In English

Contract(s)/Grant(s): AF Proj. 7184

Report No.(s): AD-A377142; AFRL-HE-WP-SR-1999-0005; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

To counteract the effects of brain injury, head protection has been designed into environments where severe head impact is probable. An experimental effort was conducted to evaluate the effectiveness of various foam pads in reducing trauma to the head resulting from impact with the ACES II headrest. A series of vertical drops with a Helmet Drop Tower (HDT) facility and an instrumented head form were conducted using the HGU-55/P flight helmet, a current ACES II headrest, and samples of two types of foam (Confor and F-Cell foam). The probability of head injury, as determined by the Head Injury Criteria (HIC), was calculated using measured impact acceleration of the head from for each impact surface. The head form acceleration, resulting HIC values, and probability of severe brain injury values for the Confor foam tests were all less than the comparative values for either the standard ACES II headrest or the headrest with the F-Cell foam.

DTIC

*Helmets; Impact Tests; Brain; Head (Anatomy); Protective Clothing*

20000062843 Cherry (R. G. W.) and Associates Ltd., Hertford, UK

**Benefit Analysis for Aircraft 16-g Dynamic Seats *Final Report***

Cherry, Ray; Warren, Kevin; Chan, Aaron; Apr. 2000; 242p; In English

Report No.(s): AD-A377374; ANM-100; DOT/FAA/AR-00/13; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

The objective of this study was to assess the number of serious injuries and fatalities that might have been avoided by the use of 16-g dynamic seats during the period of 1984 to 1998 for survivable accidents involving transport category aircraft operating under 14 CFR Part 121. Twenty-five impact-related accidents involving aircraft operating to 14 CFR Part 121, or equivalent, were identified during the period from 1984 to 1998 that may have had seat-related fatal or serious injuries. Each of these accidents was analyzed in detail and a mathematical technique was used to model each accident scenario. Monte Carlo simulations were used to assess a high, median, and low value for the total achievable benefits over the period 1984 to 1998 to U.S. registered aircraft operating under 14 CFR Part 121. Two methodologies were used. The first was based on worldwide accident data for aircraft operating under 14 CFR Part 121 or equivalent. This analysis results in the following prediction of benefit: (1) Reduction in Fatalities = 51 with a 95 percentile range from 33 to 68; and (2) Reduction in Serious Injuries = 54 with a 95 percentile range from 28 to 79. The second analysis was carried out on the accident data pertaining to U.S. aircraft operating under 14 CFR Part 121 only. The analysis of this smaller data set has resulted in the following prediction of lives to be saved: (1) Reduction in Fatalities = 23 with a 95 percentile range from 12 to 40; and (2) Reduction in Serious Injuries = 18 with a 95 percentile range from -1 to 32.

DTIC

*Injuries; Monte Carlo Method; Simulation*

20000064102 Institute for Human Factors TNO, Soesterberg, Netherlands

**Helmet-Mounted Systems for Monocular Night Vision Goggles *Final Report Helmbevestigingen voor Monoculaire HV-Kijkers***

Hin, A. J. S., Institute for Human Factors TNO, Netherlands; Tan, T. K., Institute for Human Factors TNO, Netherlands; Feb. 18, 2000; 26p; In Dutch; Original contains color illustrations

Contract(s)/Grant(s): A99/KL/337; TNO Proj. 786.2

Report No.(s): TD-00-0114; TM-00-A009; Copyright; Avail: Issuing Activity

Helmet-mounted systems for night vision goggles of two producers are tested on proper positioning in front of the eyes. A small but representative selection of persons from the Royal Netherlands Army is used as test population. Testing is performed using 3D scanning. Scans are taken from persons wearing different helmets. and scans from helmets with various mounting constructions. The positioning of the image intensifier in front of the eyes is evaluated by matching the helmets on both scans. The DSS image intensifier fixed with a frame construction on the standard Schubert helmet is positioned too low for the eyes. The ITL model fixed with a frame mount as well as a strap mount is reasonably well positioned in front of the eyes of potential users. Only a small adaptation of the positioning in height of the goggles is desirable, as well as getting the ocular closer to the eye. Although the strap-mount of the ITL image intensifier was not designed for the Gentex tank helmet, it shows the consequences of a similar type of construction as applied to the Schubert helmet. It can be decided to design a bow for each type of helmet. However, in this study we can show that one design can be developed to apply to both type of helmet. Important is to determine the proper corresponding spot on both helmets to fix the construction. Due to experiences during the research it is expected that not all constructions will operate well for long. Therefore it is recommended to proof the durability of the constructions. Frame mounts are fixed to the helmet with screws. It is recommended to perform ballistic research to check whether this modification still meets the protection level requirements of the helmet. The research produced more insight in helmets. how they are worn by persons with differences in head geometry and where the eyes are positioned underneath the rim of the helmet. The size of the region where the eyes of the different persons are located is not directly related to the differences in head size. Wearing a helmet reduces the region's size: the helmet reduces large differences.

Author

*Durability; Goggles; Helmets; Image Intensifiers; Night Vision; Performance Tests*

20000064691 NASA Marshall Space Flight Center, Huntsville, AL USA

**Volatile Removal Assembly Flight Experiment and KC-135 Packed Bed Experiment: Results and Lessons Learned**

Holder, Donald W., NASA Marshall Space Flight Center, USA; Parker, David, Hamilton Sundstrand, USA; [2000]; 8p; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The Volatile Removal Assembly (VRA) is a high temperature catalytic oxidation process that will be used as the final treatment for recycled water aboard the International Space Station (ISS). The multiphase nature of the process had raised concerns as to the performance of the VRA in a microgravity environment. to address these concerns, two experiments were

designed. The VRA Flight Experiment (VRAFE) was designed to test a full size VRA under controlled conditions in microgravity aboard the SPACEHAB module and in a 1 -g environment and compare the performance results. The second experiment relied on visualization of two-phase flow through small column packed beds and was designed to fly aboard NASA's microgravity test bed plane (KC-135). The objective of the KC-135 experiment was to understand the two-phase fluid flow distribution in a packed bed in microgravity. On Space Transportation System (STS) flight 96 (May 1999), the VRA FE was successfully operated and in June 1999 the KC-135 packed bed testing was completed. This paper provides an overview of the experiments and a summary of the results and findings.

Author

*Volatility; High Temperature; Oxidation; Water; Catalytic Activity; Procedures; Recycling*

20000064729 Analysis and Technology, Inc., North Stonington, CT USA

**Evaluation of Night Vision Goggles (NVG) for Maritime Search and Rescue: HH-65A Sweep Width Verification and Laser Illuminator Evaluation *Final Report***

Gross, K.; Wallace, H.; Larson, D.; McClay, T.; Oct. 1999; 146p; In English

Contract(s)/Grant(s): DTCG39-94-D-E56616

Report No.(s): AD-A377094; CGR/DC-231-99; USCG-D-07-00; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The U.S. Coast Guard R&D Center conducted field tests to evaluate the search effectiveness of Coast Guard HH-65A helicopters equipped with night vision goggles (NVG). The purpose of the tests was to determine if the HH-65A's NVG search performance differed significantly from that of the Coast Guard HH-60J, and to assist the Coast Guard in deciding whether to continue to experiment with a near-infrared (IR), wide-area illuminator as an alternative to the aircraft's landing/hover lights. Helicopters searched test ranges for small boats, life rafts, and mannequins. Analysts collected aircraft and target positions, target detection logs, and environmental and human factors data. Following reconstruction and analysis, sweep width data from the two aircraft were compared. No statistically significant differences in NVG search performance were found between the two aircraft. HH-65A data were combined with existing HH-60J data to produce updated sweep width tables incorporating additional illumination, environmental, and human factors conditions. Active illumination improved sweep width under all conditions tested. Low-intensity, near-IR illumination provided a small sweep width improvement over landing lights when whitecaps were present.

DTIC

*Hh-65 Helicopter; Goggles; Night Vision; Field Tests*

20000066595 Institute for Human Factors TNO, Soesterberg, Netherlands

**Digital Human Modelling Systems: Anthropometric Verification and Validation, Report 1, Test Methods and Test Instructions *Interim Report Procedure voor Verificatie en Validatie van Digitale Mensmodelsystemen***

Oudenhuijzen, A. J. K., Institute for Human Factors TNO, Netherlands; Hudson, J. A., Institute for Human Factors TNO, Netherlands; Feb. 02, 2000; 31p; In English; Original contains color illustrations

Contract(s)/Grant(s): A97/KLu/325; TNO Proj. 789.1

Report No.(s): TD-2000-0110; TM-00-A007; Copyright; Avail: Issuing Activity

The project 'Anthropometric accommodation in crew systems' is a co-operative effort of the Air Force Research Lab at Wright Patterson Air Force Base (AFRL/HECP Dayton, Ohio, USA) and TNO Human Factors Research Institute (TNO HFRI) in the Netherlands. The Royal Netherlands Airforce for the Dutch part funds this project. The main objective of the project is to identify methods for achieving anthropometric accommodation in crew systems more effective during the design process of military (and civilian?) aircraft. Human Modelling Systems (HMS's) are considered a basic element of these methods. However, the validity of the HMS's has to be proven before they can be used successfully. A procedure for verification and validation for HMS's is described in this report. The procedure consists of two separate phases. The first phase is the verification phase, the second the validation phase: 1. The output of the HMS's (for instance, limb links lengths, joint mobility, body volume, motion paths, functional measures etc.) will be compared with the corresponding variables of corresponding subjects in the verification phase; 2. The results of the overall HMS's functions will be compared to corresponding results of a field test with subjects in the validation phase. This report describes the activities for the digital analysis on the crew station of the F-16, a task to be carried out using HMS's. Other consecutive reports will describe the activities for the field test and the results of the above mentioned comparisons. The digital analysis is in fact a straightforward task for HMS'S. The results of this task will be a set of data. These data will be compared with the corresponding data from field tests on the crew station of the F-16. The data from the field tests result from comparable studies with subjects. Successive reports will describe the results of the actual verification and validation efforts using the F-16 crew system as a standard, well known, database. The aim is to evaluate all leading and commercially

available HMS's in this fashion. It is intended that these results will be used in the development of procedures and test methods for the assessment of anthropometric accommodation in planned crew systems.

Author

*Anthropometry; Field Tests; Computer Aided Design; Models*

~~20000066605~~ Institute for Human Factors TNO, Soesterberg, Netherlands

**Evaluation of Hands-Free Night Vision Goggles** *Interim Report Evaluatie 'Hands-Free' HV-Kijkers*

Kooi, F. L., Institute for Human Factors TNO, Netherlands; Feb. 10, 2000; 28p; In Dutch

Contract(s)/Grant(s): A99/KL/337; TNO Proj. 786.2

Report No.(s): TD-2000-0111; TM-00-A009; Copyright; Avail: Issuing Activity

The image quality, ease of use, and the user comfort of four night vision goggles have been compared: the ITL 'Mini Nseas' 3D with Gen 3 ITT tube, the Litton M 893 with Gen 3 Litton tube, and the DSS 'Munos' 3D with XD4 or Litton tube. The image quality (resolution and contrast) of the four systems is comparable, the XD4 showing just a bit poorer performance. In a simulated search time experiment no difference was found. The visual comfort is limited due to the monocular viewing. The DSS optics and the XD4 tube lead to slower fusion with the other, free viewing eye, indicating a risk of a further reduction of visual comfort. The most important deviations from the stated requirements ('PVE') are: (1) fogging of the NVGs with the eye cup in place (all systems); (2) too much image shift (Litton, DSS with XD4 tube); (3) absence of a dioptre marking (ITL). The ITL goggle outperforms the DSS goggle in a number of respects. The compatibility of the head mount with the helmet is insufficient. ITL has provided a functional helmet mount. The ITL was judged to be better suited for driving due to its lower weight, more comfortable head mount, and its somewhat better image quality. The compatibility with the gas mask is sub optimal. A binocular NVG was preferred over a monocular NVG for driving. Even though the driving speed for the monocular and binocular NVGs was the same, the low comfort rating indicates that a binocular NVG is the better choice for long driving periods and difficult terrain.

Author

*Goggles; Image Resolution; Night Vision; Image Intensifiers; Enhanced Vision*

~~20000067662~~ Boeing Co., Huntington Beach, CA USA

**EVA Design, Verification, and On-Orbit Operations Support Using Worksite Analysis**

Hagale, Thomas J., Boeing Co., USA; Price, Larry R., Boeing Co., USA; [2000]; ISSN 0148-7191; 8p; In English; 30th; 30th International Conference on Environmental Systems, 10-13 Jul. 2000, Toulouse, France; Sponsored by Engineering Society for Advancing Mobility Land, Sea, USA

Contract(s)/Grant(s): NAS8-39400

Report No.(s): SAE-TPS-00ICES-208; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The International Space Station (ISS) design is a very large and complex orbiting structure with thousands of Extravehicular Activity (EVA) worksites. These worksites are used to assemble and maintain the ISS. The challenge facing EVA designers was how to design, verify, and operationally support such a large number of worksites within cost and schedule. This has been solved through the practical use of computer aided design (CAD) graphical techniques that have been developed and used with a high degree of success over the past decade. The EVA design process allows analysts to work concurrently with hardware designers so that EVA equipment can be incorporated and structures configured to allow for EVA access and manipulation. Compliance with EVA requirements is strictly enforced during the design process. These techniques and procedures, coupled with neutral buoyancy underwater testing, have proven most valuable in the development, verification, and on-orbit support of planned or contingency EVA worksites.

Author

*Extravehicular Activity; Computer Aided Design; Spacecraft Design*

~~20000068483~~ NASA Marshall Space Flight Center, Huntsville, AL USA

**International Space Station Sustaining Engineering: A Ground-Based Test Bed for Evaluating Integrated Environmental Control and Life Support System and Internal Thermal Control System Flight Performance**

Ray, Charles D., NASA Marshall Space Flight Center, USA; Perry, Jay L., NASA Marshall Space Flight Center, USA; Callahan, David M., ION Corp., USA; [2000]; 31p; In English; 30th; 7th; Environmental Systems, 10-13 Jul. 2000, Toulouse, Toulouse, France, France; Sponsored by Society of Automotive Engineers, Inc., USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

As the International Space Station's (ISS) various habitable modules are placed in service on orbit, the need to provide for sustaining engineering becomes increasingly important to ensure the proper function of critical onboard systems. Chief among

these are the Environmental Control and Life Support System (ECLSS) and the Internal Thermal Control System (ITCS). Without either, life onboard the ISS would prove difficult or nearly impossible. For this reason, a ground-based ECLSS/ITCS hardware performance simulation capability has been developed at NASA's Marshall Space Flight Center. The ECLSS/ITCS Sustaining Engineering Test Bed will be used to assist the ISS Program in resolving hardware anomalies and performing periodic performance assessments. The ISS flight configuration being simulated by the test bed is described as well as ongoing activities related to its preparation for supporting ISS Mission 5A. Growth options for the test facility are presented whereby the current facility may be upgraded to enhance its capability for supporting future station operation well beyond Mission 5A. Test bed capabilities for demonstrating technology improvements of ECLSS hardware are also described.

Author

*Ground Tests; Test Facilities; Environmental Control; Life Support Systems; Simulation; Flight Characteristics*

20000068484 NASA Marshall Space Flight Center, Huntsville, AL USA

**International Space Station USA Oxygen Generator Development Testing**

Erickson, Robert J., NASA Marshall Space Flight Center, USA; Mason, Richard K., Hamilton Sundstrand Space Systems International, Inc., USA; [2000]; 5p; In English; 30th; Environmental Systems, 10-13 Jul. 2000, Toulouse, France; Sponsored by Society of Automotive Engineers, Inc., USA

Report No.(s): ICES Paper 2000-0232; Copyright; Avail: Issuing Activity

A life test of a liquid anode feed oxygen generator assembly (OGA) using SPE(R) (United Technologies Corporation, Hamilton Sundstrand Division) membrane technology was terminated in June of 1999. In the total 15,658 hours of operation at MSFC since delivery in 1995, the OGA has produced 2,103 kilograms (kg) (4,632 pounds mass (lbm)) of oxygen, and 263 kg (579 lbm) of hydrogen. Evaluation of cell stack characteristics and oxygen and hydrogen hydrophilic/hydrophobic membrane separators will be discussed.

Author

*Anodes; Liquid Oxygen; Life (Durability); Performance Tests; Electric Generators*

20000069779 National Defence Research Establishment, Div. of Human Sciences, Linköping, Sweden

**Digital Human Modeling Conference *Digital Human Modeling Conference Haag, Maj 1999***

Hoerberg, U.; Soederberg, H.; May 1999; 26p; In Swedish, May 1999, The Hague, Netherlands

Report No.(s): PB2000-103064; FOA-R-99-01153-706-SE; No Copyright; Avail: National Technical Information Service (NTIS)

The journey's purpose was to participate in the Digital Human Modeling Conference. At the conference, the following eight themes were presented. They were 'Application of Human Modeling', '3-D Anthropometry Measuring Methods and Parametric Approaches for Human Modeling', 'Think Before You Leap; Modeling Human Behavior', 'Verification and Validation of Human Models', 'Biomechanics and Human Strength Simulation', 'Human Motion and Posture Measurement', 'Human Modeling and Engineering' and 'Development of Virtual Human-Centered Engineering Systems'. The report contains reviews and comments about the sessions and the exhibition.

NTIS

*Digital Systems; Anthropometry; Human Behavior; Simulation*

20000069846 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA

**USA Navy Advanced Crew Station Evaluation Techniques**

Crawford, Jennifer; Jun. 2000; 11p; In English

Report No.(s): AD-A377911; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The U.S. Navy is tasked to perform a baseline accommodation assessment of in-service Navy and Marine. The requirement to advance the technical processes used in defining the interior confines of crew stations for the purpose of assessing accommodation issues is included in the program task. A new methodology has been developed by the U.S. Navy that utilizes advanced data collection technology and data analysis techniques. This set of procedures is called the Navy Advanced Crew Station Evaluation Technique (NACSET) which can be applied to any crew or work station. The evaluation investigates accommodation issues such as head, leg, and knee clearance, eye position, and reach ability. The analysis produces accommodation prediction equations for each issue under investigation. The prediction equations are used to develop three products: Percent Accommodated, the Individual Screening Process, and Anthropometric Restriction Codes for the USN and

USMC. NACSET provides methods for not only evaluating current crew stations, but also crew stations currently under design. NACSET methods are also easily adaptable to fit a program's specific needs.

DTIC

*Anthropometry; Crew Workstations*

20000069847 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA

USN/USMC Ejection Seat Equipped Aircraft Anthropometric Accommodation

Kennedy, Greg; Jan. 1999; 14p; In English

Report No.(s): AD-A377912; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

USN/USMC ejection Seat equipped aircraft anthropometric accommodation guidance is outdated and undocumented. Recent reassignments of aviators within the USN/USMC have highlighted an area where operational dollars could be saved by assigning candidate aviators to a correct and safe pipeline. These issues were revealed during the course of NAVAIRSYSCOM (PMA-202) Aircrew Accommodation Expansion Program where AIR 4.6, Patuxent River was tasked to perform a baseline accommodation assessment of in-service USN/USMC aircraft. The methods used in the program approach were different than procedures historically used to determine USN/USMC aviator suitability and to verify cockpit design. A multivariate statistical approach was employed and served as the basis for determining the safe accommodation envelope. The revised guidance suggested here accounts for: (1) The location of the seat with respect to the competing variables that drive the seat location; (2) The operational use of the anthropometric accommodation guidance and pipeline relational charting; and (3) The cost avoidance associated with inappropriately assigning aviators. These revised guides help to define the acceptable range of aircrew anthropometric dimensions that must be satisfied to achieve safety of flight and mission of effectiveness.

DTIC

*Aircraft; Ejection Seats; Anthropometry; Multivariate Statistical Analysis; Aircraft Pilots*

20000070335 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA

Helicopter Aircrew Integrated Life Support System (HAILSS) Aircraft Integration Tests

Reason, William; Apr. 1999; 6p; In English

Report No.(s): AD-A377892; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The Helicopter Aircrew Integrated Life Support System (HAILSS) ensemble is an impermeable coverall designed for protection in the Chemical and Biological threat arena. Additionally, the garment can be used as an anti-exposure system because the impermeable fabric effectively makes the garment a dry suit. It has booties sewn and sealed at the ankles and butyl rubber neck and wrist seals. The system employs a mesh spacer material that provides for conditioned air flow through the garment with one-way check valves on each lower sleeve for conditioned air exhaust. The entire ensemble is worn over a skin tight moisture wicking underwear. The systems is provided with protective head gear including a modified HGU-56/P two-part helmet with an integrated hood that provides for goggle demisting and aviator respiration.

DTIC

*Life Support Systems; Aircraft Pilots; Systems Integration*

## 55

### EXO BIOLOGY

*Includes astrobiology; planetary biology; and extraterrestrial life. For the biological effects of aerospace environments on humans see 52 Aerospace medicine; on animals and plants see 51 Life Sciences. For psychological and behavioral effects of aerospace environments see 53 Behavioral Science.*

20000068529 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Integrated Microchemical Analysis System Using DS2 Penetrator Technology for the Enantiomeric Detection of Amino Acids

Grunthaner, Frank J., Jet Propulsion Lab., California Inst. of Tech., USA; Bada, Jeffrey L., California Univ., San Diego, USA; Mathies, Richard, California Univ., USA; Hutt, Lester, California Univ., USA; Grunthaner, Paula, Jet Propulsion Lab., California Inst. of Tech., USA; Grannan, Sabrina, Jet Propulsion Lab., California Inst. of Tech., USA; Lin, Gisela, Jet Propulsion Lab., California Inst. of Tech., USA; Blaney, Diana L., Jet Propulsion Lab., California Inst. of Tech., USA; McDonald, Gene, Jet Propulsion Lab., California Inst. of Tech., USA; Becker, Luann, Hawaii Univ., USA; [1996]; 2p; In English; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Any strategy for investigating whether abiotic and/or biotic organic molecules are present on Mars and the search for biosignatures should focus on compounds which are readily synthesized under plausible prebiotic conditions, play an essential role in biochemistry as we know it and have properties such as chirality (handedness) which can be used to distinguish between abiotic vs. biotic origins (1). Amino acids are one of the few compound classes that fulfill all these requirements. They are synthesized in high yields in prebiotic simulation experiments, are one of the more abundant types of organic compounds present in carbonaceous meteorites and only the L-enantiomers are used in the proteins and enzymes in life on Earth.

Derived from text

*Biochemistry; Amino Acids; Organic Compounds; Microanalysis; Enantiomers*

# Subject Term Index

## A

ABERRATION, 6  
ACCEPTABILITY, 11  
ACQUIRED IMMUNODEFICIENCY SYNDROME, 7  
ACTIVITY (BIOLOGY), 14  
ADRENAL GLAND, 6  
ADRENERGICS, 3, 13  
AEROSPACE MEDICINE, 6, 7, 9, 10, 12  
AIR TRAFFIC CONTROL, 16  
AIRCRAFT, 23  
AIRCRAFT ACCIDENTS, 12  
AIRCRAFT PILOTS, 12, 23  
ALCOHOLS, 12  
ALERTNESS, 12  
AMINO ACIDS, 24  
ANODES, 22  
ANTARCTIC REGIONS, 17, 18  
ANTHROPOMETRY, 21, 22, 23  
ANTIADRENERGICS, 13  
ANTIDIURETICS, 7, 9  
ANTIFREEZES, 5  
ASTRONAUTS, 11  
ATMOSPHERIC PRESSURE, 10  
ATROPHY, 6  
AVIONICS, 16

## B

BED REST, 10, 11, 13  
BEHAVIOR, 7  
BIBLIOGRAPHIES, 6  
BINOCULAR VISION, 11  
BIOASTRONAUTICS, 4  
BIOCHEMISTRY, 2, 24  
BIODYNAMICS, 14  
BIOENGINEERING, 2  
BIOGEOCHEMISTRY, 4  
BIOLOGICAL EFFECTS, 8  
BIOTECHNOLOGY, 9  
BLOOD, 8  
BLOOD CIRCULATION, 10  
BLOOD FLOW, 11  
BLOOD VOLUME, 13  
BONES, 11  
BRAIN, 18

## C

CANOPIES (VEGETATION), 2  
CARDIOVASCULAR SYSTEM, 9  
CATALYTIC ACTIVITY, 20  
CELL MEMBRANES (BIOLOGY), 3, 14  
CELLS (BIOLOGY), 3  
CENTRAL NERVOUS SYSTEM, 6  
CHAPARRAL, 2  
CHEMICAL EVOLUTION, 3  
CHEMICAL REACTIONS, 11  
CHICKENS, 3  
CIVIL AVIATION, 12  
CLIMATE CHANGE, 5  
CLOCKS, 12  
COMPUTER AIDED DESIGN, 7, 21  
COMPUTERIZED SIMULATION, 3  
CONFINEMENT, 17  
CONTROLLED ATMOSPHERES, 17  
CREW WORKSTATIONS, 23  
CRITERIA, 11  
CRYSTAL STRUCTURE, 5  
CULTURE TECHNIQUES, 3  
CYCLIC AMP, 3

## D

DATA BASES, 15  
DATA LINKS, 16  
DEATH, 12  
DECONDITIONING, 13  
DEHYDRATION, 7  
DEOXYRIBONUCLEIC ACID, 2  
DIGITAL SYSTEMS, 22  
DISPLAY DEVICES, 17  
DRINKING, 7, 10  
DRUGS, 8, 12  
DURABILITY, 19  
DYNAMIC RANGE, 8

## E

ECOSYSTEMS, 5  
EDUCATION, 15, 16  
EJECTION SEATS, 23  
EL NINO, 5  
ELECTRIC GENERATORS, 22  
ELECTRIC STIMULI, 3  
ELECTROCUTANEOUS COMMUNICATION, 17

ENANTIOMERS, 24  
ENHANCED VISION, 21  
ENVIRONMENTAL CONTROL, 22  
ENVIRONMENTS, 16  
ERYTHROCYTES, 13  
EVOLUTION (DEVELOPMENT), 16  
EXO BIOLOGY, 3  
EXPIRATION, 10  
EXTRACTION, 8  
EXTRAVEHICULAR ACTIVITY, 21

## F

FATIGUE (BIOLOGY), 12  
FIELD TESTS, 20, 21  
FLIGHT CHARACTERISTICS, 22  
FLIGHT CREWS, 16

## G

GENE EXPRESSION, 2  
GENES, 2  
GENETICS, 2  
GOGGLES, 19, 20, 21  
GROUND TESTS, 22  
GROUP DYNAMICS, 17

## H

HAZARDS, 8  
HEAD (ANATOMY), 18  
HEALTH, 11  
HEART, 8  
HELMETS, 18, 19  
HEMATOCRIT, 13  
HEMATOPOIETIC SYSTEM, 13  
HH-65 HELICOPTER, 20  
HIGH TEMPERATURE, 20  
HIPPOCAMPUS, 6  
HUMAN BEHAVIOR, 17, 22  
HUMAN BEINGS, 7, 9, 18  
HUMAN FACTORS ENGINEERING, 16, 17  
HUMAN IMMUNODEFICIENCY VIRUS, 7  
HUMAN PERFORMANCE, 11, 16, 17  
HUMAN RELATIONS, 17  
HYDRATION, 9, 10  
HYPERTHERMIA, 13  
HYPERVOLEMIA, 10

HYPOTENSION, 8  
HYPOVOLEMIA, 13

## I

IMAGE INTENSIFIERS, 19, 21  
IMAGE RESOLUTION, 21  
IMMUNE SYSTEMS, 7  
IMMUNOASSAY, 9  
IMPACT TESTS, 18  
INDEXES (DOCUMENTATION), 6  
INFECTIOUS DISEASES, 7  
INJURIES, 19  
ISOLATION, 16

## L

LEAF AREA INDEX, 2  
LEUKOCYTES, 14  
LIFE (DURABILITY), 22  
LIFE SUPPORT SYSTEMS, 22, 23  
LIQUID OXYGEN, 22  
LONG DURATION SPACE FLIGHT, 17  
LYMPHOCYTES, 6

## M

MALES, 13  
MECHANORECEPTORS, 17  
MEDICAL SCIENCE, 9  
METABOLISM, 4  
METABOLITES, 8  
MICROANALYSIS, 24  
MICROGRAVITY, 11  
MILITARY OPERATIONS, 12  
MINERALS, 4  
MODELS, 21  
MOISTURE CONTENT, 2  
MOLECULAR BIOLOGY, 2  
MONTE CARLO METHOD, 19  
MOODS, 18  
MOTION SICKNESS, 8  
MULTIVARIATE STATISTICAL ANALYSIS, 23  
MUSCLES, 11  
MUSCULAR FUNCTION, 14  
MUSCULAR STRENGTH, 14  
MUSCULOSKELETAL SYSTEM, 3

## N

NETWORKS, 16  
NEUROLOGY, 7  
NIGHT VISION, 19, 20, 21

NOREPINEPHRINE, 7  
NUTRITION, 4

## O

ORGANIC COMPOUNDS, 3, 24  
ORGANISMS, 4  
OSMOSIS, 14  
OXIDATION, 20  
OXYGEN CONSUMPTION, 10

## P

PEPTIDES, 9  
PERFORMANCE TESTS, 14, 19, 22  
PERSONALITY, 18  
PERU, 5  
PHARMACOLOGY, 11  
PHYSICAL EXERCISE, 7, 10, 11, 13  
PHYSIOLOGICAL EFFECTS, 10, 14  
PHYSIOLOGICAL RESPONSES, 18  
PHYSIOLOGY, 4, 7  
PHYTOPLANKTON, 5  
PLANTS (BOTANY), 4  
PLASMAS (PHYSICS), 7, 14  
PLATELETS, 14  
POLYCYTHEMIA, 13  
PREDICTIONS, 18  
PRESSURE BREATHING, 10  
PRESSURE EFFECTS, 10  
PROCEDURES, 20  
PROTECTIVE CLOTHING, 18  
PROTEINS, 2, 5  
PROTOBIOLOGY, 3  
PROTOCOL (COMPUTERS), 15  
PSYCHOLOGICAL EFFECTS, 18  
PURSUIT TRACKING, 17

## R

RANGE (EXTREMES), 16  
RATS, 3, 4  
RECYCLING, 20  
REGENERATION (PHYSIOLOGY), 14  
REMOTE SENSING, 2  
RESEARCH FACILITIES, 4  
RESPIRATORS, 10  
RETICULOCYTES, 13  
RIBONUCLEIC ACIDS, 2

## S

SEA LEVEL, 5  
SENSORY PERCEPTION, 17

SEQUENCING, 2  
SIGNS AND SYMPTOMS, 8, 11  
SIMULATION, 19, 22  
SLEEP, 12, 18  
SOCIAL FACTORS, 17  
SOCIOLOGY, 17  
SOLUTIONS, 10  
SPACE FLIGHT STRESS, 17  
SPACE PERCEPTION, 11  
SPACE PSYCHOLOGY, 17  
SPACECRAFT DESIGN, 21  
SPECTRAL REFLECTANCE, 2  
STEREOSCOPIC VISION, 11  
STRESS (PHYSIOLOGY), 6, 11  
SYSTEMS INTEGRATION, 23

## T

TACTILE DISCRIMINATION, 17  
TEAMS, 16  
TELEMEDICINE, 9  
TEST FACILITIES, 4, 22  
THERMOREGULATION, 13  
THROMBOCYTES, 14  
TOXICITY, 7  
TRAINING DEVICES, 15

## V

VISUAL ACUITY, 11  
VOLATILITY, 20

## W

WATER, 20  
WATER DEPRIVATION, 7  
WATER IMMERSION, 9, 13  
WEIGHTLESSNESS, 4  
WORK CAPACITY, 14

# Personal Author Index

## A

Arnaud, Sara B., 4  
Aven, A., 14

## B

Bada, Jeffrey L., 23  
Barnes, P. R., 14  
Barnes, Paul R., 9  
Becker, Luann, 23  
Blaney, Diana L., 23  
Blank, C. LeRoy, 8  
Boster, James S., 15  
Bridge, Kristin Y., 3  
Brown, K., 2  
Butterfield, G. E., 12

## C

Callahan, David M., 21  
Canfield, Dennis V., 12  
Carr, Mary–Elena, 5  
Chan, Aaron, 19  
Cheng–DeVries, Chi–Hing C., 4  
Cherry, Ray, 19  
Chipot, Christophe, 3  
Crawford, Jennifer, 22

## D

Dahms, T. E., 12  
denHartog, E. A., 10  
DeVries, Arthur L., 4

## E

Endecott, Boyd, 12  
Erickson, Robert J., 22  
Evans, Juli, 4

## F

Fortney, Suzanne M., 10  
Frykman, Peter, 13

## G

Galarza, Laura, 16  
Geelen, Ghislaine, 7, 9

Gibson, Michael, 1  
Govorun, R. D., 6  
Grannan, Sabrina, 23  
Green, R., 2  
Greenleaf, J. E., 8, 13  
Greenleaf, John E., 7, 9, 10, 14  
Gross, K., 20  
Grover, R. F., 12  
Grunthaner, Frank J., 23  
Grunthaner, Paula, 23  
Gunderson, E. K. Eric, 17

## H

Hagale, Thomas J., 21  
Hansman, Robert John, Jr., 16  
Harman, Everett, 13  
Harper, Jennifer S., 4  
Helsdingen, A. S., 15  
Heus, R., 10  
Hin, A. J. S., 19  
Hinckley, T., 2  
Hoerberg, U., 22  
Holder, Donald W., 19  
Holland, Albert, 16  
Holland, Albert W., 17  
Hoon, Ki, 13  
Hordinsky, Jerry, 12  
Houseal, Matt, 18  
Hudson, J. A., 20  
Hutchinson, T., 13  
Hutt, Lester, 23  
Hysong, Sylvia J., 16

## J

Jackson, Catherine G. R., 7, 9  
Jensen, Christopher D., 9  
Johnson, Jeffrey C., 15, 17  
Johnson, Robert D., 8  
Jones, Susan B., 6

## K

Keil, Lanny C., 7  
Kennedy, Greg, 23  
Kooi, F. L., 11, 21  
Kozubek, S., 6  
Krasavin, E. A., 6

## L

Larson, D., 20  
Lawless, DeSales, 7  
Lewis, Russell J., 8  
Lin, Gisela, 23  
Little, Edward, 6  
Looft–Wilson, R., 13, 14  
Looft–Wilson, Robin, 9  
Lugg, Desmond J., 16  
Lukasova, E., 6

## M

Mason, Richard K., 22  
Mathies, Richard, 23  
McClay, T., 20  
McCullough, R. G., 12  
McDonald, Gene, 23  
McKenzie, M. A., 14  
Meyerhoff, James L., 5  
Miki, K., 8  
Miller, Christopher, 18  
Millett, David P., 12  
Mjolsness, Eric, 1  
Mulenburg, Gerald M., 4  
Mun, Seong K., 9

## N

Nagaya, K., 8  
Nakamitsu, S., 8  
Navidi, Meena, 4  
New, Michael H., 3

## O

Oudenhuijzen, A. J. K., 20

## P

Palinkas, Lawrence A, 17  
Palinkas, Lawrence A., 15, 16, 17, 18  
Pandorf, Clay, 13  
Parker, David, 19  
Perry, Chris E., 18  
Perry, Jay L., 21  
Pohorille, Andrew, 3  
Price, Larry R., 21

## **R**

Ray, Charles D., 21  
Reason, William, 23  
Reeves, J. T., 13  
Repin, M. V., 6  
Roberts, Dar, 2

## **S**

Sagawa, S., 8  
Schneider, Victor S., 10  
Schweighofer, Karl, 3  
Selland, M. A., 12  
Shaffer–Bailey, M., 13  
Shiraki, K., 8  
Simons, M., 12  
Smith, Dudley, 12  
Soederberg, H., 22

Strietzel, Catherine J., 3  
Stuster, Jack, 16  
Suhajda, Sierra H., 11

## **T**

Tan, T. K., 19

## **U**

Ustin, S., 2

## **V**

vandenBosch, K., 15  
vandeWater, G. J., 10  
vanErp, J. B. F., 16

## **W**

Wada, F., 8  
Wallace, H., 20  
Walraven, J., 11  
Warren, Kevin, 19  
Wenemark, R., 14  
Wertheim, A. H., 8  
Whittam, James H., 9  
Wignarajah, Kanapathipillai, 3  
Wilson, Michael A., 3  
Witham, Lynn, 16  
Wolfel, E. E., 12  
Wolinsky, Ira, 4  
Wood, JoAnna, 16

## **Y**

Young, Ronald B., 3

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.				
1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE July 2000		3. REPORT TYPE AND DATES COVERED Special Publication
4. TITLE AND SUBTITLE Aerospace Medicine and Biology A Continuing Bibliography (Supplement 502)			5. FUNDING NUMBERS	
6. AUTHOR(S)				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) NASA Scientific and Technical Information Program Office			8. PERFORMING ORGANIZATION REPORT NUMBER NASA/SP-1999-7011/Suppl502	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) National Aeronautics and Space Administration Langley Research Center Hampton, VA 23681			10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES				
12a. DISTRIBUTION/AVAILABILITY STATEMENT  Subject Category: Availability: NASA CASI (301) 621-0390			12b. DISTRIBUTION CODE Unclassified--Unlimited Subject Category - 52	
13. ABSTRACT (Maximum 200 words)  This report lists reports, articles and other documents recently announced in the NASA STI Database.				
14. SUBJECT TERMS Aerospace Medicine Bibliographies Biological Effects			15. NUMBER OF PAGES 45	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT		20. LIMITATION OF ABSTRACT